



EUROPEANS should be complimented on their energy in supporting any venture designed to protect and boom Home Industry. Their enthusiasm is no less interesting to the observer merely because it is often uncontrollable or ill-advised. On the contrary, such naivette is actually stimulating. To appreciate the thoughtful Britishers *modus operandi* you must disassociate yourself from domestic business, and discard your intrusive ideas for repulsions. "Protect Home Industry" is a phrase little used in America, where the obliging and befuddled Senate graciously assumes the entire burden. In England, however, such ideas are in full swing even in the plastics industry. France, too, has felt the inner stimulus, and Russia is developing rapidly in the same direction. Germany, perhaps, is one of the few whose industrial eyes are focused on foreign horizons, but unfortunate retributive—albeit just—handicaps have retarded her attitude somewhat. Great Britain is the most emphatic; is, in fact, the trail blazer.

Admitting her own purchasing power to be enormous, it is still incomparable with our own. This rising tide of alleged patriotic sentiment is a transparent venture; in the main, a few will profit. It will never be successful as long as two factors remain as they are at present. These are, first: that many British manufacturers buy machinery and equipment abroad for use in their own plants, and they often do this to the exclusion of reputedly identical items of home manufacture; Second, that an American, anxious to capture Empire trade, is encouraged to start a manufacturing branch of his business in the mother country.

Common sense tells us that idea men, appealing to patriotic sentiment, are very apt to have large income taxes. Democracy is apparent, in a solicitor, only when he speaks and proves that business is his motive.

The Publishers

PLASTICS

& MOLDED PRODUCTS

REG. U. S. PAT. OFFICE

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 6

JUNE, 1930

No. 6

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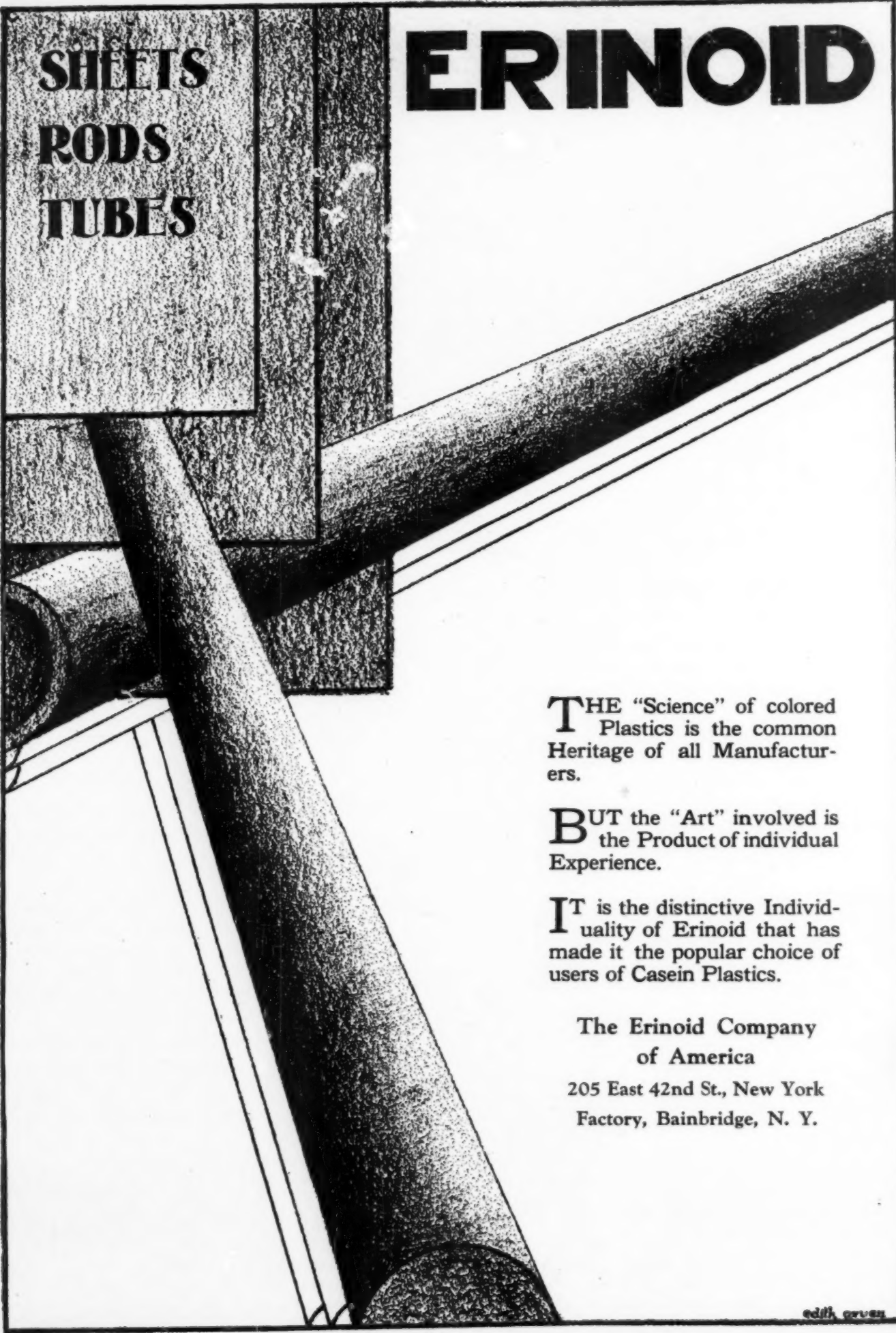
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PLASTICS

(Reg. U. S. Pat. Off.)

A periodical devoted to the manufacture
and use of plastic and composition products

Vol. 6

JUNE, 1930

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Chemical Constitution of the Molded Insulation Products

By Dr. Kurt Ripper

WHEN speaking of the constitution of the insulating products for the purposes of the present article, we refer to such materials as are moldable under heat and pressure.

The advantages of the molded products as compared with the ceramic products are so well known that they hardly are worthy of mention. Just consider, for example, the much greater mechanical strength of the molded products, the accuracy with which they can be molded, and the fact that metallic conducting inserts may be molded into them during the process of manufacture.

The attempt will be made, in this article, to explain even to the less well informed in technical subjects, some of the properties, and the chemical nature of the molded products, for there still appears to be much misapprehension in many fields as to what they really are, and how they may best be applied to their particular purposes.

The introduction of molded insulation has met with considerable sales resistance, first because of the lack of detailed knowledge concerning them and their properties, and secondly because the natural prejudice of the manufacturer and user had to be overcome. The de-

This article, by the well known German expert, is translated, with permission, from the *Kontakt-Römmeler Nachrichten*, No. 1, p. 4 (Feb. 1929).

mands that, in electrical apparatus, metals should only be used where they are essential for the conducting of the electrical current, seems quite obvious, but it took a lot of persuasion to make the manufacturers and users see the point. Even one not very well versed in the chemistry of the matter will at once appreciate that the metals by their very nature are prone to corrosion, especially when subjected to acid or alkaline vapors, steam etc. While for a long time the mechanical strength of the metals made it appear that they could not be superseded by other materials, recent progress in molded products and insulation has demonstrated that metals need only be used where they are an indispensable part of the current-carrying means in the apparatus. There is also very definite lines of division between the points where a ceramic insulating material must be used, and where the more accurate,

lighter and stronger molded products can replace both the metals as well as the ceramic parts of electrical apparatus.

In order to clear this situation, this series of articles will attempt to explain the chemical nature and the resulting properties of the modern types of molded insulation, so that the reader will be able to form a correct judgment as to whether or not he can or can not use molded insulation for a given technical purpose.

Applicability and Constitution

When analyzing the question of "Will a given substance withstand certain influences", we find that the question really resolves itself into this: "What is the chemical constitution of the material?" The constitution of a given substance is determinative of its physical and chemical properties, its reaction to certain influences, its strength, and in general its applicability to a given purpose, both qualitatively as well as quantitatively.

The molded insulating products consists, essentially, of a mixture of substances which soften under the influence of heat, and may hence be molded into a given shape, containing also fibers and other filling and

strength-imparting substances. Therefore, in order to have a proper understanding of the properties of a given plastic molded piece of insulation, we must take into consideration not only the constitution of the binding agent, but also that of the fillers and coloring matters.

Although all of the considerations may not fall into the strictly chemical field, this plays an important part. However, the plastic materials, perhaps more than any other substances, depend for their properties also upon the physical and mechanical influences that have been brought to bear upon them during the course of their manufacture and fabrication into finished articles. It should therefore not be forgotten that the properties of the finished article depend not only upon the fact that the chemist has properly done his part in the manufacture, but that the user who pressed it into its final form has given due and proper consideration to the treatment of the material furnished him. It is absolutely essential, for the production of a properly fabricated piece of molded insulation, that the directions relative to the pressing temperature, time, pressure and the like be accurately followed.

We shall first describe the various binding agents such as are being applied to the modern molded materials. Following their discussion, we shall take up the properties of the fibrous fillers, both mineral as well as organic. After that, the proper blending and standardizing of the materials will be discussed.

The Binding Agents

The modern molded insulating materials are almost without exception made with the aid of high quality synthetic resins, or, as they should really be called, "Synthetic colloids". The synthetic resins are in reality excellent examples of synthetic colloids.

Strictly scientifically speaking, the general term "colloid" does not refer to any one given

chemical individual, nor even to a group of such individuals. It is only fair to state that almost any substance is capable of being transformed into a colloidal state. In fact it may properly be said that there are four states of matter, namely: gaseous, fluid, solid and colloidal. (1). When speaking of a substance in the colloidal condition, we mean to say that the substance has been subdivided into individual small particles having a size lying about between 100 double μ and 1 double μ . Despite this general statement, there are, however, substances that exist only in the colloidal state. But there are, on the other hand also some substances whose conversion into the colloidal condition requires extensive treatment. For example, in order to convert a metal into the colloidal condition, characterized by a size of the individual particles lying within the above stated range, requires either the atomization of the metal between two electrodes or a reduction of a solution of the metallic salt in water etc. On the contrary, when glue is dissolved in water, the result is at once a colloidal solution. In fact the colloids get their name from the Greek word for glue.

Wo. Ostwald (2) designates such colloids in which the individual particles correspond in size to the size of the molecule of the substance as "eucolloids"; and those in which the particles are made of a number of molecules simply as colloids. While glue, starch, agar-agar and the like exist practically only in the colloidal condition, we have to assume that their molecules are at least as large as the particles dispersed in their solution; while a colloidal solution of metallic gold is made up of particles containing a great number of gold atoms. Modern research is gradually wiping out the distinction between these two groups of colloids, because the agglomeration of smaller particles to form larger particles is caused by forces which are probably close-

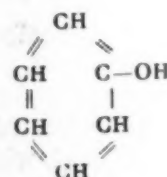
ly related to the force that builds the molecules themselves. Therefore the question as to whether the building up of the larger colloidal particles is a chemical or a physical process loses some of its importance and pertinency.

In how far these facts need to be considered in a discussion of the various kinds of binders, will be pointed out when taken them up seriatim.

The Synthetic Colloids of the Phenol-formaldehyde type

These substances are very generally merely designated as "artificial resins", and, thanks to their remarkably versatile properties, form the largest part of the modern insulating materials. The two chemical raw materials used to make these colloids are any phenol and any aldehyde. While the simplest aldehyde, formaldehyde, $\text{H}_2\text{C}=\text{O}$, is almost universally the one employed for the purpose, furfural is also used, although practically only in America. Phenol is very widely used, although cresol forms the basis for many of the synthetic resins of this type.

The phenols are a group of substances characterized by having a hydroxyl group attached to a simple or complex aromatic hydrocarbon ring, the simplest being benzene, which is monohydroxy-benzene, having a formula of $\text{C}_6\text{H}_5\text{OH}$, and consisting of a benzene ring of 6 carbon atoms, to five of which a hydrogen is attached, while the sixth one has a hydroxyl group, thus:—



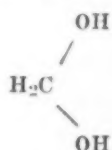
Phenol melts at 41°C , and when chemically pure is a well defined crystalline substance. The technical cresol, which is also employed as a raw material for the manufacture of synthetic resins, comprises varying pro-

portions of the three isomeric cresols, the ortho, meta, and the para-cresol, which differ from phenol and from each other in having a methyl group attached to the above-illustrated benzene ring, either alongside of the hydroxyl group (ortho), with one intervening hydrogen atom (meta), and with two intervening hydrogen atoms (para). In the latter case the methyl group will hence be diametrically opposite the hydroxyl group. The cresols are the alcohol derived from the first homolog of benzene, namely toluene, $C_6H_5CH_3$, by the substitution of one of the hydrogen atoms on the residual benzene ring by a hydroxyl group.

Cresol reacts with formaldehyde about in the same manner as does phenol, although there are certain differences which must be taken into consideration when using cresol in place of phenol. The different position of the methyl group in the cresols renders the condensation with the formaldehyde different than in the case of phenol. Thus far, the best artificial resins have been made on the basis of phenol rather than of the cresols. Phenol acts slightly acid, but is weaker than the simplest organic acid, carbonic acid.

Formaldehyde Characteristics

Formaldehyde also has a very slight acidic character. By this I do not mean that the almost ever present formic acid is intended, for even the purest formaldehyde $H_2C=O$ has the nature of an acid (3). The reactivity of formaldehyde, especially when in an alkaline aqueous solution, can also be explained by assuming a formaldehyde-hydrate formula having about the following constitution:—



It is this slightly acid character that lends the outstanding characteristics to the colloids

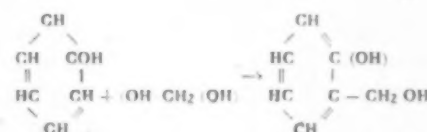
derived from phenol and formaldehyde.

Phenol and formaldehyde will unite under the widest range of chemical and physical conditions. For the purposes of electrical insulation, those products are of prime importance which have been produced by the alkaline condensation of the two raw materials. The chemistry of the reaction can not as yet be stated as having been absolutely and definitely established. This is partly due to the very fact which makes these products technically so valuable, for the final products are insoluble in practically all solvents, so that a determination of the molecular weight of the resulting condensation products can not be made. It is probably not saying too much that the properly prepared final product of the condensation of phenol and formaldehyde is the most inert organic chemical substance thus far created. As an actual determination of the constitution of these condensation products is not possible, we are thrown back to the methods of their formation for a plausible explanation of their structure. It may be said that the last stages of the condensation may soon be explained, for the advances of Roentgen ray analysis (X-ray) (4), which has made marvelous progress within the past few years, will soon make it possible to follow the building up of these products by the effect of the substances of the X-rays traversing the same when they are irradiated by X-rays.

It is a matter of interest that the reaction between phenol and formaldehyde was scientifically investigated as long ago as 1872 in which year the renowned research chemist who explained the constitution of indigo described the reaction between formaldehyde and phenol (5).

It has been found that this reaction, as well as the reaction in all such similar syntheses which lead to the formation of colloids, takes place in two dis-

tinct stages. The first stage is the formation of a purely chemical, non-colloidal, condensation product, while the second stage is an aggregation of the molecules of this simpler condensation product to form larger molecular complexes. It has therefore properly been proposed to speak of the first stage as condensation, and of the second stage as polymerization. The first step in the chemical condensation of phenol and formaldehyde is the formation of hydroxyl-benzyl alcohol, which forms in what has been generally designated as an aldol condensation reaction, thus:—



While this first compound formed is still a crystalline substance, the further course of the reaction leads to an extensive building up of a chain of these simpler products until the molecule attains a size within the colloidal range. Just how these products are formed, and how they are linked, has not yet been unequivocally determined. As to whether the building up of the larger molecules takes place according to a definite structural formula, as has been assumed by Baekeland (6), Raschig (7), Herzog and Kreidl (8), and by the most recent work of Baekeland; or as to whether it is an out and out colloidal phenomenon as assumed by Barthelémy (9), plays but a small role in the discussion to follow hereinbelow. One fact is certain, namely that as the reaction proceeds in an alkaline medium, the crystalline hydroxybenzyl alcohol yields colloidal products that even when using but small quantities alkalis eventually separate from the reaction mixture in hydrophobe (water-insoluble) form. This behavior corresponds strictly to that of a colloidal emulsion. The views of the author (10) as to the col-

(Continued on page 344)

Resinoids and the Printing Art

A resumé of the patents on resinoid applications in the printing arts, including developments in plates, inks, rollers and matrices

By Charles W. Rivise

It has already been shown how the resinoids can be utilized to perpetuate the spoken word. (Sound Records and Resinoids, Plastics, March, 1930). These useful materials can also be employed to perpetuate the written word as is evidenced by the large amount of patent literature that has grown up in this country and abroad. For the purpose of ready reference all the patents on this subject including those covering inks, printing plates, matrices, stereotypes, etc. will be presented in the form of short concise abstracts.

Australian Patent 7979/1927

Printing Plate

A printing plate or matrix may be made by impregnating filter paper, paper pulp or cellulose in sheet or mass form with an aldehyde as formaldehyde, a coal tar intermediate as phenol and a condensing agent as an alkali hydroxide or salt of potassium, sodium or ammonium. A variation consists in impregnating and laminating sheets of fibrous material by means of phenoplastic. The phenoplastic may be made in an enamelled container with or without aluminum or boric acid to hasten the reaction. When reaction is almost complete a solution of ammonium chromate or dichromate in ammonia and cuprous hydroxide are added. Instead potassium, sodium, copper, aluminum or zinc chromate or chromic acid may be used.

Similar to U. S. 1,726,151.
Austrian Patent 108,159

Stereotype Matrix

On an ordinary paper machine, alternate layers of incipient paper and of a phenol resinoid are united to form the basis for a stereotype matrix.

British Patent 26,928/1910

Printing Roller Composition

Phenolic condensation products of a resinous nature, glue, shellac, rubber, waxes, resinates, etc., may be added to sulphur derivatives of alcohols and hydrocarbons to produce a material suitable for printing rollers.

British Patent 12,659/1911

Printing Plate

This appears to be the first patent suggesting molding a printing plate from a resinous phenolic condensation product.

British Patent 2167/1915

Inking or Printing Plate

An inking roll or printer's roller composition is made in the following manner. A gelatinous compound such as glue and glycerine soaked with water is treated with (1) cyclic aldehydes such as furfural, (2) condensation product of an aldehyde and amino or amino compound, or (3) aldehyde containing compound obtained from sugars such as sucrose. Condensation of ortho-toluidine and formaldehyde and caramel and/or furfural or furfuramide are also mentioned.

British Patent 109,270, July 3, 1916

Printing Ink

A composition suitable for use in printing inks is made as follows: Acid resins obtained in the treatment of hydrocarbons, as mineral oils with sulphuric acid, are treated, while fresh, with solvents as methyl or ethyl alcohol, acetone, chlorhydrocarbons, carbon tetrachloride, di-, tri- or perchlorethylene, tetra- or penta-chlorethane, or by successive washings with two or more of the solvents to separate resins. Oils and sulphuric acid are also obtained in the process.

British Patent 145,123, March 20, 1919

Printing Plate

Printing plate is provided with a fibrous body impregnated with a phenol resinoid short of saturation and a non fibrous facing incapable of adhering to the article on which the sheet is molded.

British Patent 163,552, March 24, 1920

Printing Plate

A fibrous body is impregnated with a phenoplastic and heated until dry and crisp, coated with a cement having a filler such as lamp black, aluminum oxide, barium sulphate, silicon dioxide or wood flour, coated again but with material having smaller amount of filler and finally molded into printing plates.

British Patent 166,117, June 15, 1921

Ink

An ink is described containing cumaron resin, as one of its constituents.

British Patent 176,828

Printing Plate

Cardboard or woven fabric is coated with a thin film of phenol- or cresol-acetaldehyde resinoid containing a filler, heated to set the coating, coated more thickly and finally baked. Several sheets may be laminated.

British Patent 198,308, Feb. 13, 1923

Printing Ink

A printing ink contains a synthetic resin as cumaron dissolved in a solvent such as terpeneol with or without rosin oil.

British Patent 278,460

Printing Plate

A printing plate or matrix is made by mixing cellulose and a

phenolplastic. The phenolplastic may be made by boiling phenol, formaldehyde and alkali condensing agent as potassium hydroxide together. Strip of aluminum or small quantity of boric acid may be added to increase seething and indicate the end of the reaction when the formaldehyde ceases to come off. Cold water is added, the mixture boiled and ammonium chromate and dichromate and copper hydroxide are added with or without methylated spirits and glycerol and calcium chromate or borate. See Australian Patent 7979/1927 and U. S. Pat. 1,726,151. British Patent 307,877, March 15, 1928

Printing Ink

An ink for intaglio printing is made by incorporating a finely divided or dissolved coloring matter such as lampblack and the calcium salt of the azo dye of aniline and 2,6-naphtholsulphonic acid in a solution in volatile organic solvent of a resinous condensation product such as a urea-formaldehyde resinoid. Ethyl alcohol and iso-butyl alcohol are mentioned as solvents. British Patent 314,635, May 4, 1928

Printing On Metal

The surfaces of metals are prepared for printing by ordinary printing processes, by preliminarily coating them with substances such as natural or artificial resins, drying vegetable oils, casein, glue, etc. Canadian Patent 279,238, April 10, 1928

Printing Plate

A fibrous base is impregnated with a composition made by boiling an aldehyde, a coal tar intermediate and an alkali condensing agent, and adding a chromium salt and ammonia to form a water soluble product. Base is dried and finally molded. See British Patent 278,460, Australian Patent 7979/1927 and United States Patent 1,726,151. German Patent 271,898

Stereotype Matrix

A stereotype matrix is molded of an absorbing material, a

phenol-plastic and a structureless inorganic compound as a silicate or aluminate. German Patent 320,180, March 30, 1913

Stereotype Matrix

A stereotype matrix or plate is made by uniting sheets of fibrous material with a phenolic condensation product of a resinous nature, heat and pressure. German Patent 321,512, Feb. 3, 1916

Printing Roll

A printing roll is made of a glue mass such as a mixture of glue and glycerine swollen in water and mixed with an aldehyde-amine condensation product as formaldehyde with aniline or orthotoluidine.

German Patent 321,513, Feb. 3, 1916

Printing Roll

See British Patent 2167/1915
United States Patents
J. W. Aylsworth, 1,046,137, Dec. 13, 1912. Filed Jan. 27, 1911.

Condensation Product and Method of Making Same

Reissued as 13,531 dated Feb. 11, 1913

A composition adapted for the manufacture of printing and engraving plates is made by incorporating a higher halogen substitution derivative of a phenol, cresol or naphthol with a phenol resin to serve as a plasticity agent. Preferably the chloro substitution products of the phenols such as mono-, di-, tri-, tetra- or penta-chlorophenols or mixtures thereof are used. The plasticity agent may be added to the reagents instead of the initial resinoid in which case it combines with the ammonia. J. W. Aylsworth, 1,098,608, June 2, 1914. Filed February 11, 1910

Composition and Method of Making Same

A composition said to be suitable for forming surfaces for embossing operations and making negative matrices for engraving or printing is made as follows:

Phenol resins or any of the so-called shellac substitutes of

phenolic or cresolic origin are dissolved in methylated spirits, grain alcohol, wood alcohol or acetone of mixtures thereof together with hexamethylenetetramine or the products obtained by reacting upon aqueous ammonia with formaldehyde or its polymers. The phenol resin and hardening agent may be anhydrous. The ingredients may be separately dissolved in the solvents and mixed or they may be dissolved together or the solvent may be omitted and the methyleneamine and phenol resin mixed while the resin is in a fused condition in which case the mixture may be rolled into thin sheets for being dissolved in the solvents or made into rolls. Plasticity agents may be added.

J. W. Aylsworth, 1,098,610, June 2, 1914. Filed Oct. 28, 1913

Printing or Embossing Plate

The printing plate is either formed of, or has a surface layer on one or both sides formed of an infusible phenol condensation product containing a plasticity or solid solvent ingredient. The condensation product may be made as in Patents 1,020,593; 1,020,594 and 1,046,420 by combining a phenol resin with a hardening agent such as hexamethylenetetramine or a paraformaldehyde such as trioxymethylene. The infusible product described in Patents 942,699 and 942,809 to Baekeland are not plastic and hence unsuitable. The solid solvent may be higher chlorine substitution product of phenol as disclosed in Reissue Patent 13,531 or a chloro or nitro derivative of naphthalene, benzoic, phthalic or stearic acid or anhydride or other agents described in above patents.

The body of the plate may be made of the same material as the surface layers in which case a fibrous or inert powdered filler such as wood pulp, asbestos, cotton flock or any others should be incorporated into the composition. The body may be made of a phenol or cresol resin, a shellac composition or gum like copal, asphaltum, etc. com-

pounded with a large percentage of wood pulp or other filler.

The plate is pressed while hot and plastic against a matrix which may be the negative of a half-tone, photo-engraving, electro-type, block of type or other object in relief or intaglio, and cooled while in contact therewith. The heat used is sufficient to cure and unite the surface layers to the body of the plate, and if desired the facing layer may be formed of an uncured composition containing the necessary ingredients.

The printing plate can be made into a permanent replica of the engraving by rubbing a coloring matter over the molded surface, filling the depressed portions with a contrasting pigment, grinding the surface and varnishing the plate with a varnish such as collodion, cellulose acetate, copal or an alcoholic solution of a phenol resin.

J. W. Aylsworth, 1,137,373, April 27, 1915. Filed May 29, 1913

Composition Containing Expanded Graphite and Method of Making Same

Matrices for printing presses are molded from a composition made as follows:

Graphite is ground or otherwise reduced to desired size, screened or sized and then subjected to hot strong oxidizing agent such as nitric acid or equivalent amount of sodium nitrate and sulphuric acid or mixture of nitric and sulphur acid. This treatment causes the graphite to become coated with graphitic acid and expand about twenty-five times due to the entrapping of air or gas. The fluffy graphite may then be washed, dried, heated and completely coated with an alcohol or acetone solution of a potentially reactive phenolic resin or a mixture of an unreactive phenolic resin and polymerized formaldehyde or hexamethylenetetramine. Fillers as wood pulp, wood flour, cotton, linen, asbestos, or filamentary metal may be incorporated and the

composition dried in vacuo to recover the solvent.

J. W. Aylsworth, 1,144,338, June 22, 1915. Filed August 29, 1910

Matrix

A matrix for stereotyping processes is formed by pressing a plastic phenol condensation product or by casting a potentially reactive phenoplastic

against a plate or block of type and hardening by means of heat while in contact with the plate. The condensation product may contain fillers as asbestos or wood pulp, hardening agents as hexamethylenetetramine or a polymerized formaldehyde as dioxymethylene and/or plasticity agents as nitro or chloro de-

(Continued on page 339)

Model Molding Method Reverses the Process

FOR years the molding of phenolic resinoids has followed one of two methods—either the object was molded simultaneously under heat and pressure; or was first molded cold and then heated without pressure.

Now come Frank H. Bengé and Robert R. Titus and calmly reverse the cold molding method by first heating the resinoid until it is in the final infusible "C" stage and then applying the necessary pressure while the object is still hot. This is quite contrary to what might be expected, but apparently it works—and is patentable.

"In witness whereof," using a legal expression, behold U. S. P. 1,735,668; Nov. 12, 1929; assigned to the Continental Diamond Fibre Co. The method therein described is of sufficient interest to warrant more details than could be crowded into a mere abstract of the patent.

The inventors in describing their novel molding method state that it is applicable to various types of synthetic resins which are now treated in the molds under heat and pressure. It is particularly applicable to those resins known to the art as phenolic condensation products. These are typical of the resins which exist in two stages, the first stage known as the initial stage in which the resin is fusible and soluble and the second stage known as the final stage in which the resin is insoluble and infusible. The

change from the initial stage to the final stage is at the present time accomplished by simultaneously subjecting the resin to heat and pressure. The invention is not only applicable to phenolic condensation products but also to such other synthetic resins as are treated by heat and pressure such as those having urea or phthalic anhydride as one initial constituent. This simultaneous subjection of the resin to heat and pressure takes a considerable length of time, since it is necessary to heat the initial mass and then to bring about the chemical reaction. This time factor determines the production of the presses and hence a given unit is limited in the amount of material treated. Furthermore, the heat required in the presses causes wear and corrosion and the alternate cooling and heating of the presses is not only expensive but causes great wear on the metal parts, the packing, valves and other mechanical elements of the presses.

Their invention is characterized by a cold pressing operation, that is to say by following the present invention, it is not necessary to subject the resin to heat and pressure simultaneously but the heat is first applied and when the mass is sufficiently heated and while still in a heated condition, it is placed in a cold mold and formed to the desired shape under pressure.

The process of the present invention may be satisfactorily

employed both when molding the synthetic resin alone and when molding the resin in conjunction with a filler. In using filling materials, the processing prior to the molding step, that is to say the bringing together of the filler and the synthetic resin, is accomplished in accordance with any of the well known practices of the art.

The material to be molded is heated by any desired means to a temperature and for a time sufficient to insure conversion to the final stage after treatment in the hydraulic press. Both the temperature and time may vary widely but they are somewhat dependent on each other. For example, the use of a high temperature allows heating for a shorter time and vice versa. The mass, however, must not be heated beyond the stage where it is plastic. A

temperature approximately that now employed in the hydraulic press to cause the conversion to the hard, infusible insoluble stage gives good results. The hot plastic mass is placed in a cold hydraulic press and while still hot sufficient pressure exerted to cause the mass to take the desired shape.

In a specific case, a mass of phenol-formaldehyde resin, with or without a filler, is heated to a temperature of 300° F. for 20 minutes. While approximately at 300° F., it is placed in a cold mold in a hydraulic press and a pressure of 2200 lbs. per square inch is applied for 5 minutes. Following the old molding process, the time in the hydraulic press was approximately 45 minutes. Thus it will be seen that the production of a given unit is very materially increased. The product obtained by

following the present invention is of similar quality as that now obtained by the simultaneous heat and pressure treatment.

Considerable modification is possible in the temperature employed and in the time of heating as well as in the degree of pressure and the time of pressing.

A typical claim (there are four) is (claim 1)

The method of molding synthetic resins which comprises heating the initial condensation product of a synthetic resin at a temperature and for a time which will cause the resin to be converted into the final stage after the pressing operation, placing the hot plastic mass in a cold press and while the mass is still hot exerting sufficient pressure to obtain the molded form desired.

A Simple Pyroxylin Molding Powder

Improved Method Claims Many Advantages

TO use scrap celluloid (pyroxylin plastics) to make a molding powder has been the aim of quite a number of inventors. Only recently we reproduced an article on this subject from *Kunststoffe*.

It seems however that there are still other ways of bringing about this result. The difficulty in getting patent protection on such methods is, moreover, very nicely shown by the length of time it takes in persuading the Patent Office to grant claims in this field, for the invention about to be described was filed seven years ago (Feb. 17, 1923) but only matured into a Patent on January 21st of the present year, as U. S. P. 1,744,582, of Earle B. Scott, of Verona, N. J. The patent is now owned by the Toledo Automatic Brush Machine Co., of Toledo, Ohio.

In the manufacture of celluloid articles from celluloid stock

the usual form of the material or stock furnished to the trade which manufactures celluloid articles is in sheets, rods or tubes of varying thicknesses, the size usually being standard, and owing to the form in which such stock is made up a relatively large quantity of scrap is produced, so that in manufacturing the average line of celluloid articles the amount of scrap produced seldom goes below 25% of the material used and sometimes reaches as high as 40% thereof. This waste is generally produced because the blanks for molding are of an irregular shape and when cut out cannot be dove-tailed in blanking an entire sheet without leaving a large percentage of unusable skeleton or scrap. If, instead of molding, the blank pieces are cut to shape, the scrap is still further increased. I shall hereinafter refer to this

character of scrap as regular scrap.

Former Method

The scrap celluloid produced in this way, as well as from spoilage, is usually sold back to the manufacturer at a very low price and is then re-worked by costly methods into new celluloid stock of the same form. The usual process of so re-working celluloid is to cut the scrap up in a fodder cutter into small pieces, wash it and then soak it up into a dough-like mass with a solvent composed of camphor and ethyl alcohol. Parts of this dough-like mass, if of proper color, may be added to an entirely new batch of celluloid or a lot composed entirely of scrap may be run through. Usually in the latter case a dark color is produced in order to hide dirt and the variations in color of the original scrap.

Among the objects of this invention are to produce a usable or commercial celluloid molding powder which, upon the application of heat and pressure may be molded into celluloid articles without waste; also to utilize the various kinds of celluloid scrap, in the production of such a usable celluloid at a very low cost and at the same time to overcome the objections to the celluloid produced from the "regular" scrap.

New Practices

The celluloid scrap is first preferably cleaned by washing the same in a water and soap solution; it is then preferably subjected to a crushing pressure by which the cellular structure is fractured or broken down and the celluloid scrap assumes a flaky or loosely-cohering form, which flaky substance readily disintegrates into a powder. This crushing is preferably accomplished by passing the said scrap through a pair of rolls and preferably accurately ground steel rolls. By this means the scrap is therefore first crushed to a relatively coarse dust or powder. Celluloid so crushed is in excellent shape to be further reduced to a relatively fine powder and this is preferably accomplished by grinding the initially crushed flaky or coarsely powdered material in a pebble mill. Celluloid cut into small pieces and treated in a pebble mill as has heretofore been done is reduced by attrition and not by crushing and attrition as is the case with more brittle materials not possessing the toughness and elasticity of celluloid. Therefore, by initially crushing the celluloid to small particles by the use of steel rolls and then subjecting it to treatment in the pebble mill for reduction to a fine powder, the time necessary to achieve the object is shortened to such an extent as to be entirely within practical economic limits; whereas if small pieces of celluloid were so placed in the mill and then

ground thereby to a powder, the cost would be increased so much that the method would have but little advantage over the present method of utilizing scrap.

In practicing my invention, ground numerous batches of such crushed celluloid were dry in a pebble mill with an explosive vent, i. e., a canvas-covered opening that would readily give way under a slight pressure. There has been no trouble in the way of the celluloid dust firing. Scott says that he has usually grounded the pebble mill to prevent sparks from frictional electricity and used porcelain in preference to flint pebbles in dry grinding. He also used small mills in which the friction is not as intense as in mills of large diameter. The use of such small mills is made practical through the preliminary or initial crushing of the celluloid by the rolls, the celluloid being placed in the mill in such a comparatively fine state of division that it does not require the heavy attrition of a large diameter mill to reduce it to a fine powder within a practical length of time, viz, thirty-six hours. The celluloid powder should, in order to obtain the best results in a molding powder, be ground in the pebble mill fine enough to pass through a 200 mesh sieve. This reduction to a fine powder of 200 mesh was accomplished in eighteen hours.

Solvent Important

In grinding the crushed celluloid to powder in a pebble mill, he preferably, however uses sufficient water to prevent any fire hazard. This moisture is subsequently removed and preferably is extracted by vacuum-drying or by filter-pressing and vacuum-drying after the celluloid is powdered to a sufficient fine degree. Celluloid does not absorb moisture as does pyroxylin, and it is therefore comparatively easy to remove such moisture.

In the next step of the process the celluloid powder is mixed with a powdered solid solv-

ent of celluloid, such as acetanilid, camphor, methyl acetanilid, or other well known solid solvents or their mixtures. The amount of solid solvent used is controlled largely by the solid solvent initially used in the celluloid scrap and the melting point it is desired to obtain in the solid solvent. The solvent employed is usually from 10% to 25% of the weight of the celluloid powder used, and in view of the fact that there is already sufficient camphor in the celluloid powder and that methyl acetanilid has a comparatively low melting point, it is preferable to use this solid solvent.

Natural Advantages

The mixing of the powdered solid solvent and celluloid powder is preferably accomplished by grinding them together in a pebble mill but they may be mixed in any ordinary mixer that will insure a homogeneous product. When the solid solvent is so mixed with the celluloid the mixture is pressed into cakes of the exact form of the mold and when so caked it forms a caked molding powder that can be used directly in molds to make celluloid articles that have all the desirable qualities and characteristics of celluloid articles molded from regular celluloid sheet or tube stock, and furthermore have the additional quality or characteristic that it will with greater perfection and precision take the exact form of the mold and enable sharper outlines to be produced, so that, if desired, delicate half tone printing surfaces may be molded therein. The use of the new molding powder, eliminates the following difficulties usually met in molding sheet, tube or rod stock into articles, viz—

Cracks due to lack of moldability or stretching material beyond its elastic limit,,

Heat marks due usually to green stock that softens too much,

Indefinite molding tempera-

(Continued on page 340)



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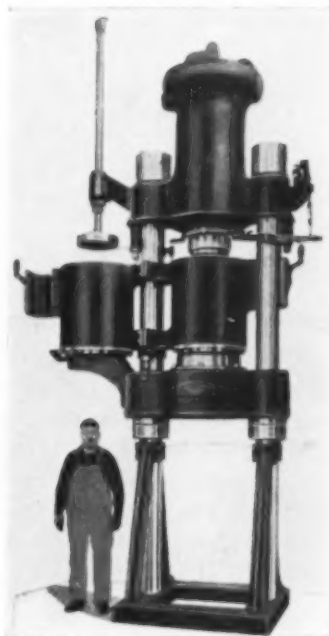
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Molding Artificial Ornamental Stone

Wide Field of Application Evident

OUR readers no doubt remember the review on "Pyroxylin as an Imitative Material." The artificial resins, for many years limited practically to dark brown and black, have within the past four years blossomed out in the colors of the rainbow.

It is not surprising therefore that there should be serious attempts to produce highly decorative effects with the resinoids. The Kurz-Kasch Co., of Dayton, Ohio, well-known molders, last November obtained a patent on what appears to be a very useful process of producing imitation onyx, agate, marble and the like from resinoid plastics. Harry N. Copeland is the inventor and the patent is U. S. P. 1,735,674; Nov. 12, 1929.

This invention relates to the molding of plastic materials and more particularly to the production of an ornamental surface of pleasing appearance, somewhat in imitation of natural onyx, agate, marble, and the like, upon articles molded therefrom.

Color All-Important

While the method is herein described as applied to the molding of synthetic resins, phenolic condensation material and other substances of analogous character, it is to be understood that it is capable of application to a wide variety of materials. The present invention is a further development and amplification of the invention disclosed in patent to Harry N. Copeland, No. 1,593,525, dated July 20, 1926, which pertains to the imitation of wood graining upon molded articles.

The present invention involves the use of materials of different colors and of different consistencies or capable of assuming different degrees of plasticity. Bodies of various sizes

The progressiveness of the Kurz-Kasch Co. is again proved by recent patent on resinoids for semi-precious stones. Advance in technique will open up markets now generally available only to fabricators.

of the different colored material are intermixed with each other. These bodies of irregular size and shape may be comparatively large, depending somewhat upon the size of the article to be molded and the character of the surface markings desired. The character of the material is such that when one of the materials, preferably though not necessarily that possessing the predominating color is in a plastic, viscous or "mushy" state, and capable of being molded, the material of other color or colors will be in a more freely flowing condition. The latter material will not only fill spaces between the masses of the plastic or less free flowing material but will follow the small interstices and crevices, forming irregular streaks, veins and hair lines. In areas where the plastic or less free flowing material does not initially contact the mold, the differently colored more liquid material will form a thin film of varying thickness over the surface of the more dense material. The effect is heightened by employing a material of translucent character which will show the underlying material of dominating color through such film in varying tints and which will afford diminishing streaks and hair lines on the surface of the masses of dominant colored material. Such material of translucent character will also give to the product a pleasing luster or seemingly polished surface,

quite similar to that of polished onyx, agate, marble and the like. The method permits of the use of a wide variety of color combinations, whether the materials are of translucent or opaque character, or a combination thereof. The effect may also be varied by changing the proportions of translucent and opaque material in the mixture. By employing a predominating quantity of translucent material of different colors onyx and agate may be imitated. The use of opaque materials of different color and capable of assuming different degrees of plasticity enables the imitation of marble with various markings.

Variety of Types

While as before mentioned various materials having different fusing points or capable of being reduced to different degrees of plasticity may be employed, phenolic condensation materials are preferred because of their permanency and durability and the wide variety of colors in which they are obtainable as well as their other variable characteristics, which make them especially adaptable to the present process. Phenolic condensation materials are obtainable possessing wide variation of fusing points. Some require quite high temperature to soften or render plastic while others become quite fluid under like conditions. Such material may also be had transparent and in varying degrees of translucency.

In carrying out the method or process phenolic condensation materials or the like are selected according to the desired combination of colors and are intermixed in the approximate proportions in which it is desired

(Continued on page 341)

A New Rodless, Semi-Automatic Press

**New Burroughs press has attractive features
which recommend it for large or small jobs.**

THE Burroughs Rodless Semi-Automatic Press, — the latest development in molding equipment,—is the result of sixty years experience in the originating and improving of plastic molding machinery.

The Burroughs Company introduced the rodless type of press years ago, as a great improvement over the rod type in which adjustments were frequently required, due to loosened nuts and non-parallel platens. Conceiving the idea of fixed molds, this company then evolved the inverted-ram, or semi-automatic press as a great advance over the hand molding equipment then in use. The angle-molding press, and tilting head press were then successively originated by Burroughs, for their special fields, after which attention was turned to creating a new machine which would handle the semi-automatic work better, and handle other types of work otherwise requiring special equipment. The new Rodless Semi-Automatic is the result of this effort, embodying the utmost in versatility, convenience, dependability and ultimate economy.

Easy Maintenance

This new machine not only has features making it applicable to special work, but offers many improvements for the simple, large or small production job. All parts being readily accessible, maintenance is reduced to a minimum, while efficiency is at a maximum through convenience of operation.

This press, having simple, detachable main-cylinders, may be furnished to suit practically any line pressure, and may be reduced in capacity to accommodate a smaller mold, by the substitu-

tion of a smaller pair of cylinders. In this way, any press may be used at any desired tonnage, up to its nominal capacity, being thus a variable press, without resort to a reducing valve or a change in line pressure. Note that for either replacement of cylinders or repacking, it is necessary to remove only two bolts to detach cylinders. In repacking, it is not even necessary to remove the cylinders from the press, as these may be dropped down, in place, on the upper platen, with the line pressure to the push-back cylinders cut off, thus allowing plenty of room to replace either U-packing at the top. The cylinders may then be returned to place by restoring the pressure in the push-backs. The total time consumed is but a few moments, and the operation does not require the breaking of a pipe-joint, or the handling of a single part, other than the packing-retainer rings. With smooth copper lined cylinders, far removed from the heat of the mold, repacking is seldom necessary. For removal of cylinders, the ram is tapped to receive an eye-bolt, and shouldered at the bottom to carry the cylinder while being moved. Thus the cylinder and ram are conveniently removed as a unit, after having been dropped down, with the line pressure off, as before, in the case of repacking.

The push-back cylinders are likewise held in place by two bolts only, and need not be removed from the press for repacking. With the upper head blocked up, pressure cut off, and two retainer bolts removed, the push-back cylinders may be slid upward on the rams, exposing the packings for replacement. These cylinders are copper-lined to prolong the life of the packings, and are provided

with non-corrosive rams fitted with felt wipers to exclude abrasive materials from the cylinders. While the push-backs may be easily replaced at any time, for special work, they are properly proportioned for all ordinary usage. Please note that the push-backs perform one function only,—their effectiveness not being reduced by acting as ejectors.

Top and Bottom Ejectors

Independent, top and bottom, hydraulic ejectors are furnished as standard equipment. These are centrally located, away from the heat of the mold, and are foot-operated, at any point of the stroke. This operation allows freedom of the hands for such purpose as holding a tray to receive all the top-ejected pieces at one time. Ejection not being dependent upon the stroke of the press, as is customary, this press-stroke may be reduced when allowable, effecting economy in time and high pressure water. Each ejector actuates a four-armed spider, operating two T-slotted master ejector bars at the ends of the platens. These master ejector bars permit the positioning of transverse ejector bars to suit the individual mold, eliminating the special spider or ejector frame heretofore required for each separate mold. This feature, ordinarily repeatedly paid for in each individual mold, has been incorporated in the press, as a great economy and convenience. The ejectors being positive in action in either direction, and operative at any point of the stroke, may be used for a number of special purposes, such as rigidly holding down a loose insert-retainer plate in the mold, while the mold is closing. In addition to the main ejectors, with their many pos-

sible uses, is a secondary ejector of the usual type. This has many possibilities in conjunction with the main ejectors, and is especially useful for operating a stripper plate. Incidentally, the hydraulic and secondary ejectors may be combined, where unusually heavy power may be required for a special job. The top ejector may be easily repacked by removal of the top yoke, or spider. This requires the withdrawing of the ejector ram with the yoke, after removal of four ejector-rod nuts, and ejector stop nuts. The lower ejector is mounted on a shelf, or holder, which may be slid forward, after removing the cap screws holding the ram to the yoke. In this position repacking is easily accomplished, with the yoke undisturbed. Upper and lower ejector cylinders are interchangeable, and are fitted with non-corrosive rams, and with dust shields to exclude abrasive materials.

Long, Narrow Platens

The press platens are of the long and narrow type,—providing the shape of surface proven to be the most efficient for large production work. The lower platen is fixed, while the upper is guided by four bronze shoes, adjustable to any side clearance desired. Each platen carries two adjustable bolsters, which may be set to accommodate various widths of molds, while three adjustable parallels afford support for the central portion of the mold between bolsters. The bolsters afford insulation between the heater plates and press, and at the same time, by use of gib strips allow of the simplest means of holding down the mold or heater plates. The parallels may be set to accommodate the mold ejector pins in various molds, eliminating the special grids usually employed for this.

Machined faces and T-slots on all four uprights provide for bolting on any special accessories that may be required in the operation of special molds.

Thus, horizontal cylinders may be used for operating horizontal mold pins, from any or all four sides, and similarly, three-part or split molds may be operated. Such accessories may be purchased separately as required, with the assurance of fitting the press and coordinating with it.

Note the slip joints on the rear uprights of the press, eliminating the most frequent source of trouble encountered in making steam connections. The inlet and outlet to the top

dies are adjustable to suit the height of mold. The fixed bodies have three outlet ports to allow for making the shortest and most convenient connection to the lower dies. The extra deep stuffing boxes with brass followers can be readily and quickly repacked.

This new rodless type of semi-automatic press is built in a range of standard sizes covering all tonnage requirements, and adaptable to practically all molding work.

Sound Records and Resinoids

By Charles W. Rivise

(Continued from page 279, May issue)

26. J. W. Aylsworth & E. L. Aiken, 1,282,011, Oct. 15, 1918. Filed June 19, 1912.

An engraved copper cut containing a reversed facsimile of the label impression is formed preferably in half tone and pressed against a member formed of a condensation product such as described in Patent 1,020,593 which may consist of a mixture of fusible ingredients capable of transformation into infusible product, or of a final infusible product incorporated with a solid solvent or plasticity agent. The fusible composition may be placed in the form of a powder in a mold with the half tone on top and molded and transformed by heat and pressure into the infusible form, after which the cut is separated therefrom. The plate thus formed is rendered electro-conductive by means of a coating of graphite and an electrotype made therefrom by submerging the plate in an electro-plating bath and stripping. The face of the electrotype containing the label design is coated with an adhesive such as a mixture of beeswax and resin and is placed with its coated face in engagement with that portion of the face of a master or sub-master record at which it is desired that the label impression appear and united by heat and cooling. The assembly is made electro-con-

ductive and coated electrolytically with copper and the electrotype is stripped. By this process the electrotype of the label impression is made an integral part of the record matrix. Coloring matter may be rubbed over the molded label if desired.

The sound record is preferably made with a surface veneer of a hardened infusible condensation product having incorporated therein plasticity ingredients.

27. T. A. Edison, 1,342,326, June 1, 1920. Filed Aug. 26, 1915.

A condensation product of shellac and paraphenylenediamine is dissolved in alcohol. The solution is thoroughly mixed with wood pulp and molded with heat and pressure into record. Surface of record may be of shellac, celluloid, or final hardened phenolic condensation product.

28. T. A. Edison, 1,369,272, Feb. 22, 1921. Filed Aug. 5, 1919.

A series of molds each containing a record blank are supported on the platens of an open press; heat is applied to render the blanks plastic and then the press is closed under full molding pressure. The blanks are of the Edison type i. e. they consist of a filler of wood flour and powdered chalk with a binder such as shellac or resin and coated with a phenolic condensation product.

29. T. A. Edison, 1,377,192, May 10, 1921. Filed Jan. 18, 1919.

A mixture of a resin such as pine oil, a drying oil such as linseed oil and an oxidizing agent such as lead peroxide are boiled, then mixed with China clay and cotton flock with application of heat. The mass is cooled, ground, oxidized by treatment with hot air and molded into a record. It is incidentally mentioned that the record blank may be covered with a veneer consisting of phenol resin and hexamethylenetetramine. This patent differs from Patent 1,377,193 in that binder includes both oxidized resin and drying oil.

30. T. A. Edison, 1,377,193, May 10, 1921. Filed Jan. 23, 1919.

Resin such as pine rosin is oxidized by boiling with lead peroxide, mixed with China clay and cotton flock in heated mixer, ground, subjected to hot air, and molded into sound record disk blank. Blank may be coated with varnish of phenol resin and hexamethylenetetramine after which the blank is pressed against sound record matrix to form sound grooves.

31. E. E. Novotny, 1,398,144, Nov. 22, 1921. Filed July 21, 1920.

A base of porous substance such as felted paper consisting chiefly of wood fiber or any open mesh material even chipboard or strawboard is impregnated and coated successively or simultaneously with Bakelite or Condensite. Impregnation is with minimum amount of phenolic condensation product and coating material contains hardening material such as Barium sulphate, iron or zinc oxide and suitable hardening catalyst such as nigrosin or zinc chloride. Upon this coating which acts as a sound barrier is applied a coating of condensation product and lampblack to make a relatively soft layer in which sound grooves may be impressed. Between coatings blank is heated to partially harden previous coating.

32. E. E. Novotny, 1,398,145, Nov. 22, 1921. Filed July 21, 1920.

Fibrous material such as strawboard or chipboard impregnated but not saturated with Bakelite or Condensite is semi-cured and applied to both faces of a thin sheet of perforated or imperforate metal such as lead, tin, steel or aluminum which has been coated with a varnish containing phenolic condensation product, barium sulphate and alcohol. Barrier coatings of condensation product and barium sulphate are then applied and the assembly cured to any desired extent. Sound grooves may be molded by pressing blank against matrix.

33. E. E. Novotny, 1,398,148, Nov. 22, 1921. Filed Nov. 2, 1920.

Blank made exactly in the manner described in Patent 1,398,147 is made into sound record by pressure and heat between metallic matrices. During heating and molding the condensation product in the blank reaches the final infusible state or if desired the heating may be just sufficient to make condensation product hard but not infusible. Base sheets may be left unimpregnated and the barrier layer omitted.

34. L. Weisberg & R. S. Potter, 1,424,137, July 25, 1922. Filed Feb. 19, 1921.

A resin is made by causing glycerol or a polyglycerol to react with phthalic anhydride in somewhat the same manner as described in Patent 1,108,330 to Callahan. Some of the phthalic anhydride may be replaced with polybasic aliphatic acids such as succinic, malic, tartaric, maleic, fumaric, citric or malo-malic acid. The product may be mixed with shellac and used as a substitute therefor as in the molding of phonograph records.

35. J. P. Wright, 1,438,078, Dec. 5, 1922. Filed June 26, 1919.

Record may be made of Bakelite or of separately treated laminations of fabric saturated or surrounded and embedded in the binder and may be reenforced with one or more layers of woven material such as metal. The reenforcement is shown on the

back but it may be embedded in the body of the disk. The binder may be some other material, even ordinary glue may be used.

36. E. E. Novotny, 1,440,097, Dec. 26, 1922. Filed Nov. 4, 1920.

Record made exactly in the manner described in Patent 1,398,147 except that condensation product is made from phenol, acetaldehyde and hexamethylenetetramine.

The phenol is heated with acetaldehyde in a closed vessel in the presence of a very small quantity of hydrochloric methylenetetramine may be added directly to the resin or to the resin dissolved in alcohol or acetone.

37. E. E. Novotny, 1,451,783, April 17, 1923. Filed Jan. 21, 1921.

A blank is first formed by impregnating a fibrous base with fusible condensation product and driving off the solvent or by molding a well-mixed mixture of fibre pulp and pulverized dry infusible condensation product. The blank is coated on both sides with phenolic varnish; pulverized infusible condensation product is sprinkled thereover and the blank is pressed against a master record with heat and pressure to weld the layer and reproduce the sound grooves. The product is a matrix and may be used to impress sound grooves in a record blank made in the same manner. A double record may be made by interposing a blank between two matrices. A variation is to apply the pulverized condensation product to the face of the master instead of on the matrix blank and on the matrix instead of on the record blank. The condensation product may be a phenol-formaldehyde, phenol-acetaldehyde or phenol-furfural resins with catalysts and hardening agents.

38. E. E. Novotny & D. S. Kendall, 1,470,637, Oct. 16, 1923. Filed Jan. 17, 1922.

Discusses prior art and states that phenol and acetylene have

(Continued on page 344)

Technical Abstract Section

A Concise Review of Patents and Literature

Mixed Organic Esters of Cellulose.

Hans T. Clarke and Carl J. Malm, assignors to Eastman Kodak Co. U. S. P. 1,735,159; Nov. 12, 1929.

A mixture of 544 parts by weight of commercial stearic acid, (a mixture of stearic and palmitic acids in nearly equal proportions) and 300 parts by weight of 95% acetic anhydride is distilled slowly through a fractionating column until the weight of the distillate amounts to 288 parts by weight. This distillate consists principally of acetic acid while the composition of the residue approximates closely to that of a mixed anhydride of stearic and acetic acids.

A mixture of 350 parts by weight of the mixed anhydride, prepared as described in the preceding paragraph, 350 parts by weight of chloroacetic acid, 1 part by weight of magnesium perchlorate trihydrate, and 40 parts of acetylation paper the type of clean cotton cellulose tissue paper customarily used in making cellulose acetate is warmed at 60 to 65° C. until a homogeneous dope is formed and the fibres of cellulose have substantially disappeared. This normally occurs in about 20 hours. The finished reaction dope is then poured into methyl alcohol or ethyl ether in order to precipitate the cellulose acetate. The latter is then washed with further methyl alcohol or ether. The product is soluble in acetone or chloroform, or mixtures of them; but is insoluble in benzene. From its solutions it can be formed by spreading and evaporating into transparent films possessing a most remarkable flexibility, which persists even under very dry atmospheric conditions. It contains about 37% of stearyl.

Casein Molding Mixture. Lawrence V. Redman, assignor to Bakelite Corporation. U. S. P. 1,732,533; Oct. 22, 1929.

A mixture is prepared comprising by weight:

	Parts
Casein	100
Urea	100
Paraform	100
Water	50
Ethylene glycol	40
Aqueous ammonia	13

These ingredients are thoroughly commingled in suitable mechanical mixing devices, for example in a ball mill followed by sheeting on differential rolls. The resin-forming reaction takes place largely under the sheeting rolls, at which point also the volatile components including water introduced with the reagents, as well as that resulting from the reaction of urea and formaldehyde, is largely driven off, resulting in a nearly anhydrous and thoroughly homogeneous mixture of the casein, the urea resin and the glycol.

The molding mixture prepared as above has good molding qualities and under standard hot-press molding conditions yields hard and strong molded articles which are infusible and but little affected by neutral solvents. Thiourea may replace the urea.

Cellulose Derivative Molding Powders. Comille Dreyfus and George Schneider, assignors to Celanese Corporation of America. U. S. P. 1,732,330; Oct. 22, 1929.

100 lbs. of cellulose acetate ground to a fine powder are introduced into a mixing machine provided with a heating jacket, and about an equal weight of water is poured in and mixed thoroughly for about half an hour therewith. Then there is added to the damp mixture about 30 lbs. of triacetin in solution in about 100 lbs. of benzol and the whole is mixed thoroughly for about two hours. Heat is then gently applied to the jacket until all or practically all of the benzol and most of the water is driven off and the mixture is then taken from the mixer and dried off in drying cupboards or the like.

Phenol-formaldehyde Condensation Product. George W. Stryker, of Los Angeles, Cal. U. S. P. 1,737,031; Nov. 26, 1929.

A condensate material formed of formaldehyde and phenol combined in the presence of a catalizer and heated at a temperature ranging from not below 118 to not above 134 degrees F., such temperatures being effective for eliminating the aqueous elements, the heating being maintained for such a length of time as will insure the prevention of stratification.

The process of making a condensate material which consists in mixing formaldehyde and phenol in the presence of a catalizer and heating the mixture at a temperature ranging from not below 118 to not above 134 degrees F., for a period of time sufficient to eliminate the aqueous elements and prevent stratification.

Phenol-furfural Resin. Emil E. Novotny, assignor to John Stogdell Stokes, of Spring Valley Farms, Huntington Valley, P. O., Penna., U. S. P. 1,737,121; Nov. 26, 1929.

Example 1

In a suitable vessel connected to a condenser, to 100 parts of phenol add 75 parts of furfural and 1/2 part potassium carbonate. The mixture is heated to 300° F., at which stage the external heat is discontinued and the mass of itself increases in temperature to 305° F. It is then allowed to gradually cool for a period of 8 to 12 hours. The product thus

obtained is semi-solid whereas if the mass, after reacting at 305° F., is rapidly chilled, a thin, syrup product is obtained. It should be noted that in both cases the reacting mixture is completely combined.

Example 2

In a suitable vessel connected to a condenser, to 100 parts of phenol add 75 parts of furfural and 1/4 part of potassium carbonate. Heat to 350° F., allow the reaction to proceed. A semi-solid product is thus obtained. for 30 minutes, and cool the mixture. 7 other examples are given.

Molding Mixture. Victor H. Turkington, assignor to Bakelite Corporation. U. S. P. 1,728,378; Sept. 17, 1929.

Wood-flour is first charged into a steam-heated kneading machine and is stirred therein until thoroughly dried. Furfural or equivalent high-boiling reactive aldehyde is added, preferably in the proportion of about ten percent by weight of the wood-flour, or slightly more. If desired, any appropriate dye, according to the color required, may be introduced in solution in the aldehyde. At the same time with the furfural, and while the kneader is running, a suitable methylene-containing hardening agent, preferably hexamethylenetetramine in the form of fine dry powder, is likewise introduced, and the operation of the machine is continued for several minutes, or until the furfural, dye and hexamethylenetetramine have been thoroughly and uniformly distributed through the wood-flour. The quantity of hexamethylenetetramine added is suitably proportioned to the amount and quality of the non-reactive phenolic resin to be subsequently added, suitable proportions being about 15 parts by weight of hexamethylenetetramine for each 200 parts of a phenol resin prepared by thoroughly reacting 7.5 mols of phenol with 6 mols. of an active methylene, preferably formaldehyde. The resin thus prepared is of the non-reactive or permanently fusible type, and should be hard, brittle and readily powdered at ordinary temperatures, but liquid and permanently fusible at elevated temperatures, say 140° C. The total quantity of resin employed in a typical case may be approximately equal to the combined weights of the wood-flour and the furfural. The resin is preferably added slowly to the mixture in order to avoid lumping or jamming of the mill, and the kneading is continued at a temperature approximately 100° C. until the mass is thoroughly homogeneous. The mix is then dumped onto a cooling table, and after cooling is cold-ground to suitable mesh for use as a molding powder.

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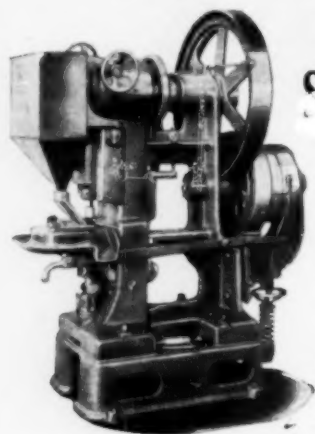
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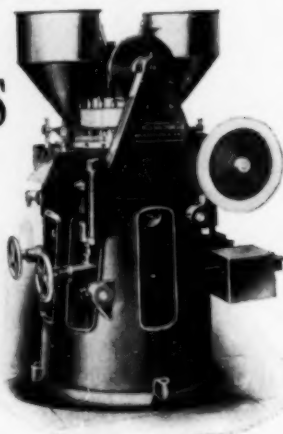
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Process of Making Resins. Jacques C. Morrell and Gustav Egloff, assignors to Universal Oil Products Co., of Chicago, Ill. U. S. P. 1,744,135; Jan. 21, 1930.

Distillates produced from the cracking of petroleum are separated into polymeric constituents thereof from the rest of the distillate by passing the distillate first through a filter bed, as for example, fuller's earth, or other suitable filter bed, collecting the polymeric hydrocarbons in the bed, where they are separated from the other hydrocarbons, which will pass through the bed and will be drawn off. The polymeric hydrocarbons may then be dissolved out of the fuller's earth by suitable solvent, as for example, alcohol, ether, chloroform, or the like, and the solvent is then distilled out of the polymers. The polymers resulting from the vapor phase treatment of cracked distillates may also be used.

These polymeric hydrocarbons may then be mixed in a suitable vessel or container with a phenolic compound, such as phenol, cresols, tar acids from wood, coal, peat, etc., or other compounds. Through this mixture, preferably at a temperature of, say 300 degrees F., is then passed chlorine gas. The chlorine gas reacts with the mixture and forms resinous materials. The treatment is preferably continued until the mixture has become relatively viscous but in most cases should not be so viscous that it is not sufficiently plastic to permit of it being moulded under pressure. The material is then allowed to cool and is ready for use.

Claim 1

A process of producing resins which comprises subjecting a mixture of polymeric hydrocarbons and a phenolic body to the action of a halogen until the mixture has become viscous.

Cellulose Esters. George W. Miles and Camille Dreyfus, assignors to Celanese Corporation of America. U. S. P. 1,742,611; Jan. 7, 1930.

20 grams of linters are treated with 30 ccs. of glacial acetic acid and allowed to stand for 24 hours. There is then added 70 ccs. of a mixture containing 70 ccs. of phosphoric acid (H_3PO_4), (sp. gr. 1.85), 3 ccs. glacial acetic acid, and left for 24 hours at 80°-100° F. Then there are added 10 grams of metaphosphoric acid (HPO_3), 30 ccs. of the above 70-30 mixture and 20 ccs. of glacial acetic acid. After standing for 24 hours the mix is is precipitated, washed and dried, and it shows on analysis 56.5% combined acetic acid.

In the above example approximately 2% of sulphuric acid may be added to the glacial acetic acid first added in order to hasten the acetylation of the cellulose.

15 examples are given: Some of the claims cover:—

A process of manufacturing organic esters of cellulose which comprises the steps of pretreating cellulosic material with a mixture of phosphoric acid and an organic acid and subsequently esterifying the pre-

treated cellulosic material by treating the same with a mixture of an organic acid corresponding to the ester desired and a phosphoric acid, the amount of the organic acid present during the esterification step being substantially larger than that present during the pretreating step.

A process of manufacturing organic esters of cellulose which comprises the steps of pretreating cellulosic material with a mixture of a phosphoric acid, an organic acid and a small amount of sulfuric acid, and subsequently esterifying the pretreated cellulosic material by treating the same with a mixture of an organic acid corresponding to the ester desired and a phosphoric acid, the amount of the organic acid present during the esterification step being substantially larger than that present during the pretreating step.

Resinoids and Printing

(Continued from page 326)

rivatives of naphthalene, benzoic acid or anhydride. The matrix is illustrated as a reversed facsimile of an intaglio or relief plate (photo-engraving, photo-electrotype, half tone, block of set type, etc.)

Molding Composition and Method of Making Same

J. W. Aylsworth, 1,146,299, July 13, 1915. Filed July 22, 1913

A fusible phenolic resin such as phenol resin made by condensing phenol or cresol with formaldehyde is brought into solution by means of an alkali or alkaline oxide or hydroxide. A filler such as wood flour, asbestos fiber, or cotton flocks is thoroughly intermixed therewith and the base neutralized by heating in air or by the addition of an acid. Neutralization causes the condensation product and salt to be precipitated about and within the filler. In case the base is an alkali, the acid may be stearic or palmitic, or an acid resin such as contained in colophony or common resin may be used. In case of an alkaline base, sulphuric, oxalic or carbonic acid may be used, the latter preferably in form of a gas. A hardening product such as hexa is incorporated and the product molded to infusible form. The formed blank is then coated with a fusible phenol resin that may be hardened after the impression is made.



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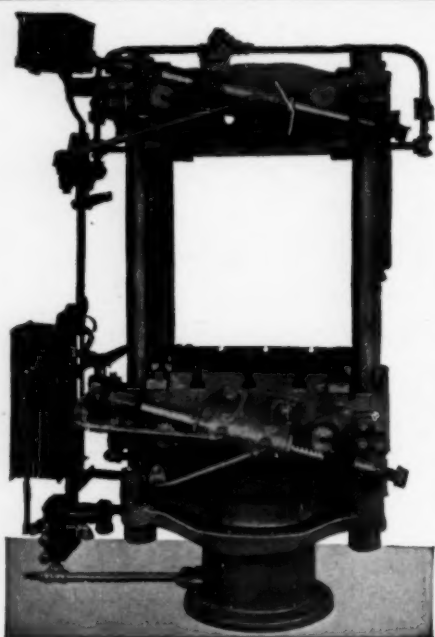
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Pyroxylin Molding Powder

(Continued from page 328)

ture due to variation in sheet stock brought about by age, temperature and moisture conditions,

Warpage due to forcing a mass material into a mold and setting up unequal internal strains.

The mold containing the molding powder is placed under heat and pressure conditions sufficient to cause the solid solvent in the molding powder to melt and dissolve the celluloid, the whole combining under the heat and pressure into a homogeneous solid mass. When methyl acetanilid is used as the solvent, if the material is subjected to a heat of 100 to 115° C. for a sufficient length of time to liquefy the solvent, and if while thus heated a pressure is applied of about 100 to 500 pounds to the square inch, depending on the form of the mold, the powdered materials will be converted into a homogeneous molded mass, and will retain the exact shape of the mold on cooling under pressure into solid celluloid.

Adding Dies and Pigments

If it is desired to color the celluloid a pigment may be added to the power at the same time the powdered solid solvent is added, a sufficient quantity of the pigment being added, of course, to produce the color effect desired. This is usually the same percentage as in celluloid produced in the regular way.

Dyeing of the celluloid powder can also be effected by placing such celluloid powder, before mixing with the solid solvent, in a dye solution of the proper color containing water and a so-called celluloid-softening agent, such as acetone or acetic acid, which act as softeners in the presence of water. After such dyeing the celluloid is removed from the solution by filter pressing and is dried and mixed with the powdered solv-

ent to form a molding powder.

The claims surely are broad enough! For instance claim 1 covers a molding powder for producing celluloid articles composed of powdered celluloid and a powdered solid solvent of celluloid.

2. A molding powder for producing celluloid articles consisting of a given quantity of celluloid in a finely powdered state and a quantity, also in a finely powdered state and approximating between 10% and 25% of the weight of the celluloid powder, of a solid solvent of celluloid, the said powdered solvent and powdered celluloid being thoroughly mixed together to form a homogeneous product.

3. The process of producing a celluloid molding powder which consists in reducing solid celluloid to a fine powder and mixing such powder with a solid solvent in powdered form to form a homogeneous mass. 15 claims is all were allowed.

Artificial Stones

(Continued from page 332)

the various colors shall appear in the design. These materials are preferably in coarse granular form or in pieces of comparatively large sizes. The dominant color is preferably in comparatively large bodies, while the material intended to produce the streaks, veins, hair lines and color splotches of the design is preferably in smaller pieces, distributed among the larger bodies of dominating colored material. Such material in measured quantity is placed in the mold. The material is preferably though not necessarily cold pressed into tablets or slugs containing the requisite amount of material for the particular article to be molded.

The usual commercial mixture of phenolic condensation material begins to fuse or become plastic at approximately two hundred to two hundred and twenty degrees, Fahrenheit, and becomes more or less "mushy" or plastic at a temper-

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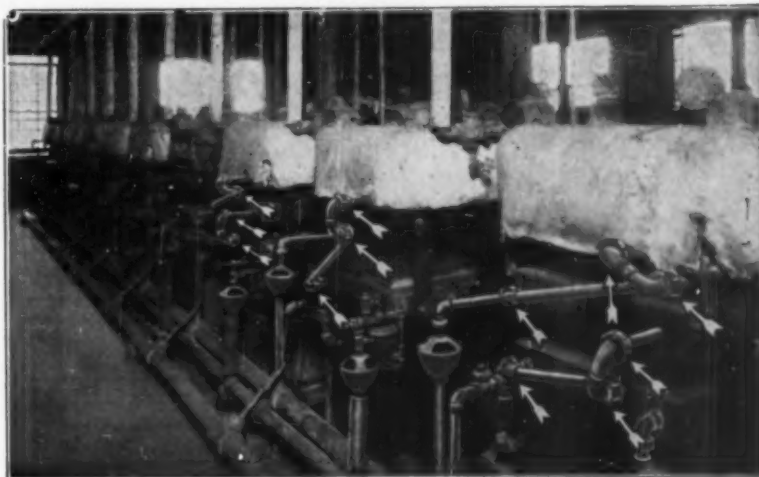
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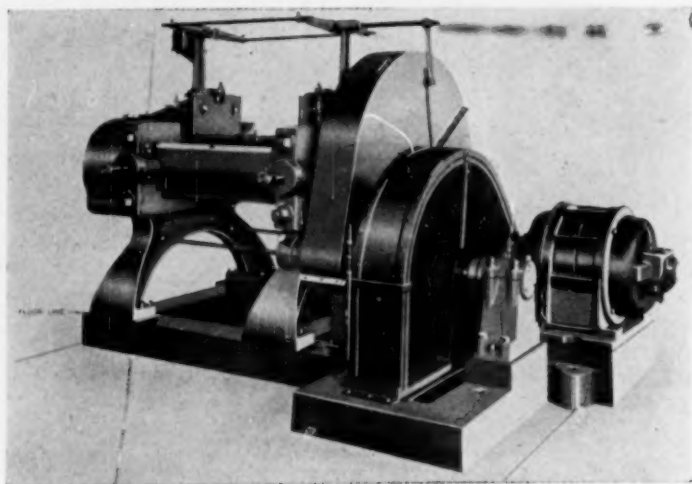
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ature of approximately two hundred and sixty to three hundred degrees, Fahrenheit. Beyond three hundred degrees a chemical reaction takes place and the material which at a lower temperature became soft and plastic at the higher temperature becomes set or hardened. In the present process the material of dominant color may be commercial phenolic condensation material. However, the material employed to demark the streaks, veins, and lines of the design, is of a much lower fusing point. In the practice it has been found that the synthetic resins which are of phenolic character but fuse at a much lower temperature than the commercial phenolic condensation material makes a suitable combination with such commercial material. The phenolic condensation material employed in the present process is fused at a subnormal temperature. That is to say the fusing temperature is somewhat below that normally employed, in phenolic molding operations, so that the material does not become fluid or free flowing but assumes a plastic condition in which it may be molded but will not mix with the accompanying colored material. This accompanying colored material having a much lower fusing point becomes liquid at the same subnormal temperature which renders the dominating material only plastic. As a consequence when subjected to pressure the liquid material of lower fusing point, preferably though not necessarily a synthetic resin of phenolic character, will flow freely between the larger bodies of plastic material of dominating color, filling all crevices and openings and spreading over the surface of such dominating colored plastic material where the contact with the mold is not perfect. This distribution of the liquid or highly fused material over and around the bodies of more dense material having the higher fusing point, produces intricate fanciful designs in close imitation of onyx, mar-

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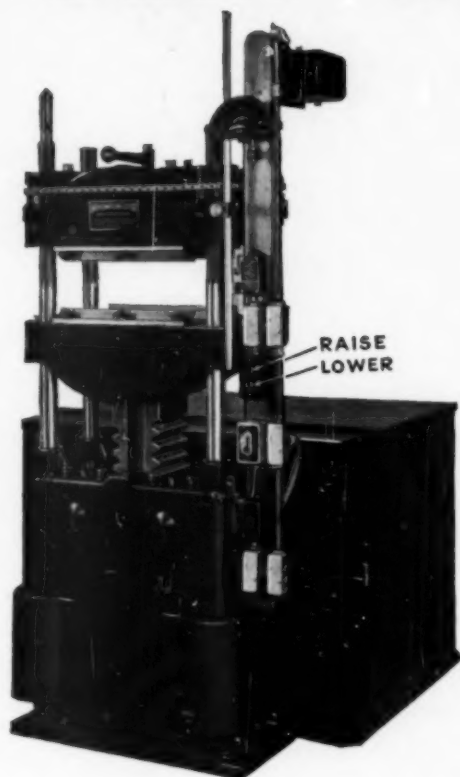
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ble or agate. The initial molding operation and irregular distribution of material having been effected at a subnormal molding temperature, the molded article is then subjected to a curing temperature, preferably in excess of three hundred degrees Fahrenheit, in the usual manner, thereby causing the material to set and harden with the surface design permanently fixed therein. The synthetic resins before mentioned as well as some forms of commercial phenolic condensation materials are of more or less transparent, or translucent character. The use of such materials, particu-

larly where one material overflows the other in a thin film, produces a graduated tinted effect. The process is quite flexible in affording a wide range and variety of effects and designs.

Mixtures

The materials of both high and low fusing points may be both opaque or they may be both translucent. As a further variation the material of high fusing point and of dominant color may be either translucent or opaque and the colored material forming the design and of lower fusing point may be of the contrary characteristic. Still fur-

ther variations of effect can be had by minimizing the quantity of high fusing material and employing a predominating quantity of material fusing at the lower temperature.

No less than 21 claims thoroughly cover the invention. Examples of the claims are

The herein described method of producing ornamental surfaces upon articles molded from plastic materials, consisting in intermixing bodies of differently colored materials reducing one of the materials to a plastic condition and reducing the other material to a substantially liquid condition, and molding

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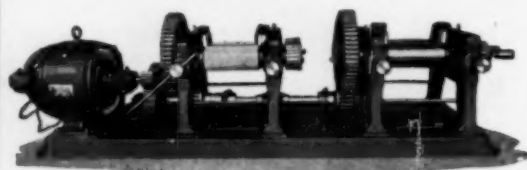
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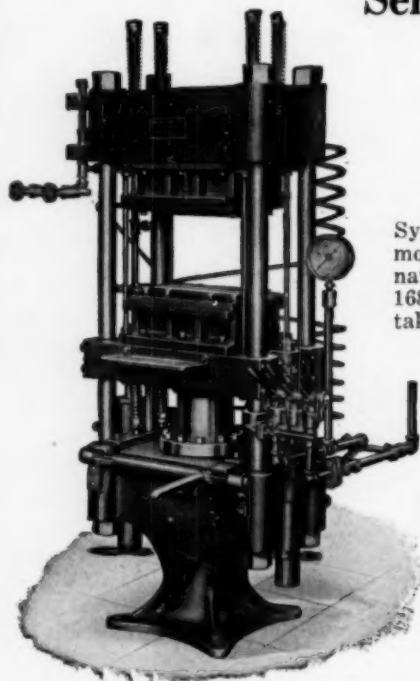
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the material under pressure whereby the more liquid material is unequally distributed in the mass and caused to fill the openings and irregularities occurring in the body of plastic differently colored material.

As an article of manufacture, an article molded from plastic material and characterized by irregular translucent streaks, and veins defining flow lines effected by relative movement of portions of the material in the mold, in imitation of onyx or the like.

Sound Waves and Resinoids

(Continued from page 335)

been condensed in the presence of mercuric sulphate as a contact agent and sulphuric acid as a catalyst, and that this product has been hardened with paraldehyde in presence of an acid. Phenol-free phenol acetylene resin containing some mineral acid such sulphuric is heated in auto-clave by admission of steam and paraldehyde added with agitation, steam being turned off and cold water added.

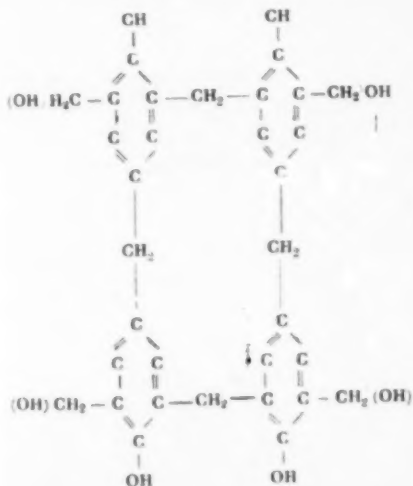
(To be continued)

Constitution of Insulation

(Continued from page 323)

loldal phenomena involved have been confirmed by an interesting process patented by the German Bakelite Gesellschaft (11), in which process the resin is precipitated from the reaction mixture by purely colloid-chemical methods by the addition of lyotropic acting substances. The initial colloid form may also be separated from the reaction-mixture by mechanical means, such as by causing its separation from the water, by distillation, followed by purification when the product is obtained as a substance having great similarity to the natural resins in appearance, and which therefore were given the unfortunately misleading name "artificial" resins, for they have nothing in common with

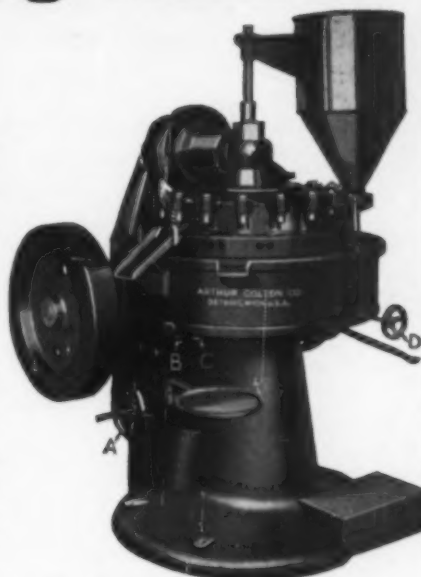
the natural resins as far as their chemical and physical characteristics are concerned. This initial condensation product, which from a colloid-chemical point of view may properly be designated as a hydrophobe emulsoid, has the property of melting on heating, and, according to the method of preparation forming a more or less viscous or completely fluid mass when so heated. Furthermore, this initial product is soluble in alcohol, acetone and other organic acids. It is soluble in alkaline solutions, but precipitated therefrom by acids. This property makes it necessary to employ only a small amount of the alkaline condensing agents so that the initial product may properly separate from the residual water initially introduced by reason of the use of the aqueous solution of formaldehyde for the dissolving of the phenol. As alkali-solubility is generally predicated upon the presence of hydroxyl groups, it must be assumed that some free hydroxyl groups are still present in the initial condensation product. Rashig (7) for example assumed that the alkali-soluble first product had a constitution which might be stated as consisting of four hydroxybenzyl alcohol groups linked into a closed ring by intervening methylene (CH_2) groups; there being at least two phenolic hydroxyl groups still free at the outside of the ring of phenyl groups. This may be exemplified as follows:—



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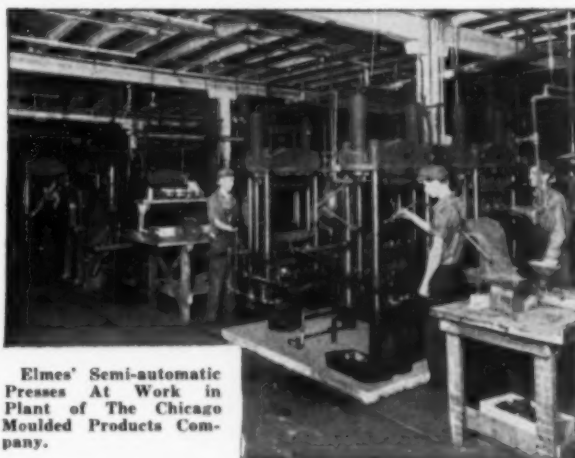


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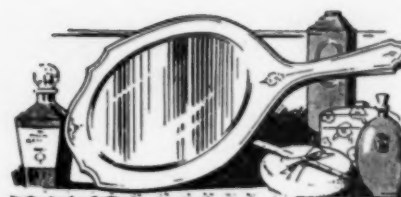
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Vol. 4

JUNE, 1930

No. 6

Synthetic Resinoids In Grinding Wheel Production

Phenolic resinoids have been employed for over ten years but now others find use in specific cases

By R. A. Worley, Chief Chemist

Precision Grinding Wheel Co., Inc.

FEW readers of **Plastics** would be much interested in the history of the early development of grinding wheels, but recent developments in the use of organic materials and especially synthetic resins, should prove intensely interesting.

The first grinding wheels were produced by bonding natural emery with fusible ceramic mediums at moderately low temperatures. Natural emery contains magnetic iron combined with natural corundum. It was the corundum content or crystallized Al_2O_3 which was the cutting ingredient of the natural emery. An intense study of this material led to the development of a material which was practically all crystallized Al_2O_3 or crystallize corundum. This product was developed synthetically in the electric furnace, and is the basis of the well known abrasive Aluminum Oxide, best adapted for grinding materials of high tensile strength, when bonded in the form of grinding wheels. The most widely known of the synthetic abrasives of this type are Alundum, Aloxite and Hy-Tens. These abrasives are commercially furnished in what are known as sizes:

8	16	36	80	140	220
10	20	46	90	150	F
12	24	60	100	160	FF
14	30	70	120	180	FFF

These sizes roughly indicate the mesh through which the abrasive grains are sized.

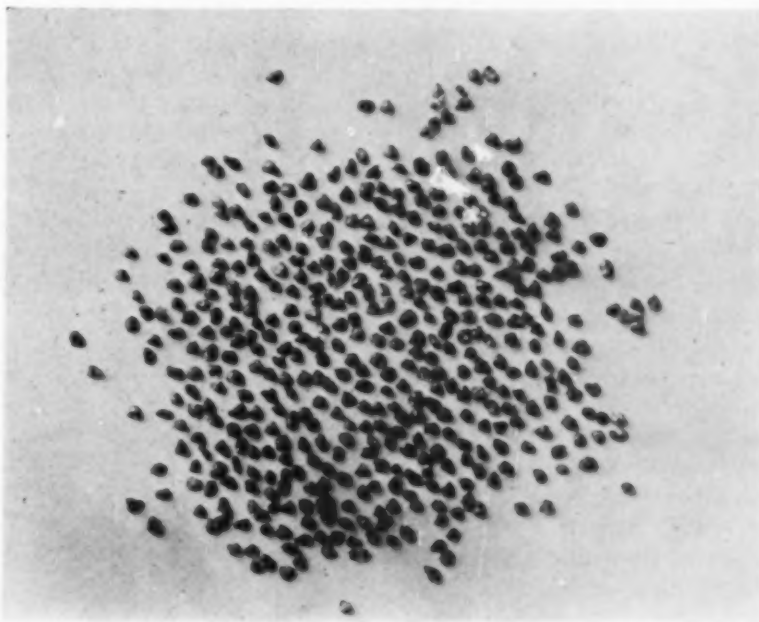
Grinding Wheel Grades

There is another widely known type of abrasive, Silicon Carbide, which has no counterpart whatever in nature, but which is best adapted for the grinding of materials, especially when bonded in the form of grinding wheels, which possess low tensile strengths, or are of a non-metallic nature. The best known of these are Carborundum, Crystolon and Lo-Tens.

The grade of a grinding wheel

indicates the strength of the bond or the tenacity with which it holds the abrasive grain in the body of the wheel under grinding pressure. Wheels may be furnished in nearly all sizes of grain from coarse to fine and in all grades of hardness from very soft to very hard.

The control of composition and manufacture of grinding wheels is probably closer in its limits than that of almost any other manufactured product. Not only does the grinding wheel manufacturer have to produce compositions which are definite, but when compositions



Abrasive Grains Crushed and Sized.

are selected as the best for a certain operation, the grinding wheels must be duplicated on repeat orders, so that they will give consistent and uniform performance.

This means a very close control of raw materials entering into the composition of the wheel and a careful control of all processes. The limits of sizes are very exact, distribution and balance must be within very close limits and the greatest precision exercised throughout their manufacture.

Ceramic Binders

Grinding wheels containing both of the above mentioned abrasives are bonded by what is known as Vitrified or ceramic binders, which are composed of fusible ceramic materials, so designed and balanced as to produce definite grades (namely tenacity of grip between bond and abrasive) by heat treatment through kilns of various types.

Other binders or bonds are Silicate of Soda, Rubber, Shellac and Synthetic Resins. The last mentioned group of materials are the latest comers in the field. The most important and most widely used is the phenol-formaldehyde condensation product so well known to the reader as Bakelite. The application of Bakelite to the bonding of Aluminous and Silicon Carbide abrasives has given to the industry a material available for certain types of work, which is now beyond the experimental stage.

Problems in Resinoid Binders

The problems presented to the engineer in the application of synthetic resins to grinding wheel manufacture are many and complex. Mixing conditions, softening agents, solvents, time factors, pressure and temperature must be properly adjusted to produce a uniform product of high tensile strength, cool cutting and of porous structure to facilitate chip clearance.

Of the many developments in the field of synthetic resins, a few show promise of successful application to grinding wheel manufacture at the present time. The phthalic-anhydride-glycerol condensation product known as the Glyptal type resins, are worthy of further study. The phenol-furfural type resins also show promise of success in this connection. The vinyl resins which have recently been developed have certain properties which may make them desirable for grinding wheel manufacture. However, the present high price prevents their consideration.

More than 95% of all the grinding wheels manufactured with synthetic resin as a binder are made of Bakelite. Due to the willing and complete co-operation of the Bakelite Corporation, through their technical staff, with the wheel manufacturers, this material has found a place of its own in wheel fabrication.

Bakelite Used Since 1917

The development and application of this material has been rapidly progressing since 1917. The Precision Grinding Wheel Company being a pioneer in the development of coarse, open wheels for heavy duty work. Constant improvements have been made in grinding wheels using Bakelite as a bond for the abrasive grain.

Bakelite wheels are furnished in grades from 2 to 4, which are soft, 6 to 10 which are medium,

12 to 13 which are hard, and 14 to 15, which are very hard.

The resinoid is furnished in a powdered form, mixed with proper chemicals and abrasive grains, which form by far the greatest bulk of the wheel. The resultant mix is formed in moulds and cured at various elevated temperatures. The wheels, after forming and curing, are subjected to complete machining operations, tested for density, tenacity, grade, balance and ability to stand a high centrifugal strain before they leave the manufacturer's plant.

Grinding Wheel Speeds

Wheels bonded with organic binders, such as we are discussing in this article, must stand surface speeds up to a mile and a half and in some cases two miles or over per minute, depending on the composition, use and recommendation of the manufacturer. All of these wheels must be tested at speeds considerably above those at which they are to be used, so that the centrifugal strain factor of safety is very high.

To explain the term "high speed" a little further, the average Vitrified grinding wheel will run a mile a minute or 5000 surface feet per minute most efficiently for cutting, whereas the resinoid bonded wheel must run at higher speeds to be most efficient, namely from a mile and a half to two miles per minute. At lower speeds, the resinoid wheel is not efficient. This
(Continued on page 362)



Final Wheel Inspection.

They Always Come Back

Some striking thoughts on price-cutting in general
and the lessons the Molding Industry may draw

By *Benn C. Budd*

O. S. Tyson and Co., Inc.

LET us look at selling conditions as they are today. Sales are harder to make, they are smaller in volume and they cost more. Many salesmen are reporting reasons for lost orders "price too high". Sales managers, trying to keep volume up, have let Old Man Price Cut slip into conference with them.

As Al Smith says "Let's look at the record". We can't get away from the fact that selling is harder. But we should hesitate before we jump at price cutting as a way to relieve the situation. Perhaps prices of some commodities are too high. Where prices are held up artificially a buyers' strike will ensue. Rubber and copper are recent examples.

What Price Cutting?

But molded products are competitive—too much so, say some. Prices have been in line with production, material and sales costs. When these prices are cut either profits, labor or workmanship suffer. And years of work in building up a business are thrown away. For it is a fact that you can't be a price cutter today and a regular business man tomorrow. Buyers' memories are long when it comes to price cuts.

A small corner grocer in my town taught me a good lesson on price maintenance. I noticed that some days he registered very few sales. But when I suggested that he do a little price cutting to compete with the chain stores he replied "They always come back to me". Here was a homely Will Roger type of philosophy. "They always come back."

No worry for this business

man over a dull day. He had something the chain didn't—personality. And when his customers were in a penny pinching mood he just cleaned up his shop, perhaps brushed up his personality—and they always came back. What is of greater interest is the fact that his *yearly* profits were many times that of the price cutter.

Cutting or Quitting

Out in Cleveland there's a druggist—Miller by name—who sells more high priced articles, sells them oftener and has got rich doing it. Ask him about "price cutting" and he'll tell you—"One price cut and I'd be out of business".

Up in Canada there's a printing firm—one of the biggest in the world. The president will tell you that they have grown and grown and grown because of one policy—"No price cuts". They are not afraid to see a hundred presses idle. In a few days they'll be turning again for they know "They always come back".

Modernizing Methods

Swift, of meat packing fame, was showing a group of friends through his Chicago plant. Pointing to a long line of cattle headed for the slaughter house, he explained "We lose \$2.40 on every one of them". A friend asked how he ever made any money at that rate. "But look at the *volume*", was his answer. The real truth of this story is that Swift meant working under ordinary old-fashioned methods they would have lost \$2.40 on every animal. But their modern methods were netting a handsome profit.

This Swift incident is mentioned because it may explain why one firm loses an order to a competitor and cries "price cutter" when the facts are that superior production facilities and economic sales methods enable this competitor to sell for less and yet make a greater profit. If we strike an average between the optimists who claim business is 100% perfect today and the pessimists who see the whole industrial structure about to collapse, we arrive at a rather encouraging picture for this year's business.

The Deflated Dollar

This picture indicates that selling will be harder than in the past. As a matter of fact, this condition has yearly been becoming more noticeable. Commodity prices are definitely on the decline all over the world. In time this condition will adjust itself so that while we will have less dollars they will buy more. During this period of adjustment there always has been and probably always will be, a lot of business grief. Foolish wasteful price cutting will be indulged in by panicky firms. Eventually they will eliminate themselves and leave the field open to those firms who could see no reason for giving their money away and who knew, just as the corner grocer knew, that "They always come back".

The encouraging part of this year's business picture is that more firms are overhauling their production and distribution methods. Now is an opportunity for molders to show how molded parts will assist a manufacturer in re-designing his product. For years he has probably been satisfied with his regular materials—"Not inter-

ested in Bakelite, Durez or any other molded material". Today he is interested if he can be shown where molded parts fit into his product and will save time and money.

Perhaps he has been satisfied with the appearance of his product. Color and beauty have meant nothing to him. Today falling sales volume will force him to look into this new selling force of beauty. And molded parts or containers of Lumarith, offer him an opportunity to build up sales through better appearance.

Sales Resistance

Increased resistance always requires increased force to overcome it. Sales resistance has increased — therefore greater sales force or energy is needed. And needed by almost every industry in the country. Price cutting is not a force, it is a destructive weakness just one step removed from giving goods away. Utilizing business conditions as they are today as a constructive force to increase use of molded products is one good method of helping business and improving molded product volume. Every reason that has ever existed for the adoption of a molded part or article is still in force.

Mission of Molded Products

Molded products will according to their application either improve performance of the product they are used in, save money for the manufacturer or improve the appearance of his product or his package.

It is obvious that manufacturers are desirous of improving their product performance, cutting their manufacturing costs and adding beauty and color to their line. Any one of these factors will create more new business than price cutting in established markets. And this new business is business that will come back for more and more molded products.

New Method for Making Porous Pyroxylin Storage Battery Plates

POROUS acid-resisting materials can readily be prepared from such pyroxylin plastics as celluloid by a new process given to the art by Arthur Z. Pedersen, of West Orange, N. J.

Here is the way he describes it himself in a patent (U. S. P. 1,732,140) granted to the Peploid Corporation on his application, which was filed seven years ago, but just recently emerged from the Patent Office.

My invention is applicable to a large class of colloidal substances. I do not believe that any attempts have been made to endow such substances, with the exception of pyroxylin plastics, with the property of physical, as distinguished from mechanical, porosity; and in the case of pyroxylin plastics, to my knowledge, such attempts have not been successful. A method often tried is to mix a solution of celluloid with certain salts which are later washed out of the resulting product. It is almost an obvious comment that this method can not give a material suitable for storage battery separators, since the passage ways presumably left in the substance by the washed out salts are necessarily of dimensions which would permit solid particles of the same order of dimensions to penetrate the material, thus destroying the efficiency of the separators which soon become clogged. If the material is intended for use in filters, the noted objection is still more apparent. Besides, I found that it is practically impossible to entirely wash out the salts because the celluloid tends to surround the particles of the salts with an impervious film. This formation of an impervious film appears to be the stumbling block in almost all the attempted processes of the character here discussed. According to my discovery, no method of manufac-

turing porous celluloid can be successful unless two conditions are satisfied, of which the first is self-evident namely:

I. If the porosity of the final product is to be such as to prevent the passage there-through of particles of greater than colloidal size, the substance mixed with the celluloid and later washed out must be a colloid; and

II. The solvents used in connection therewith, and the means for removing these solvents, must be such that no impervious film is formed on the surface or anywhere in the mass of the resulting substance upon the removal of the solvents.

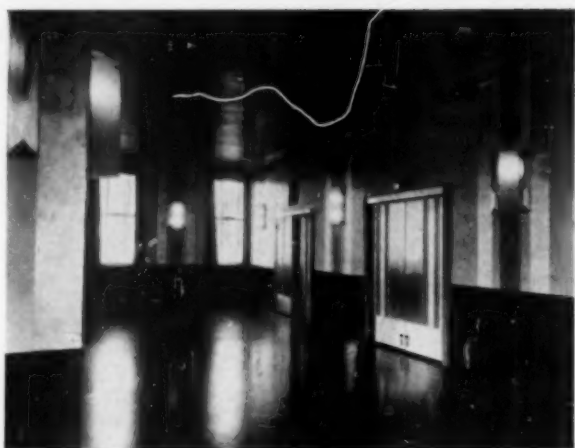
In my method, both of the above conditions are satisfied.

My invention, broadly, is as follows:

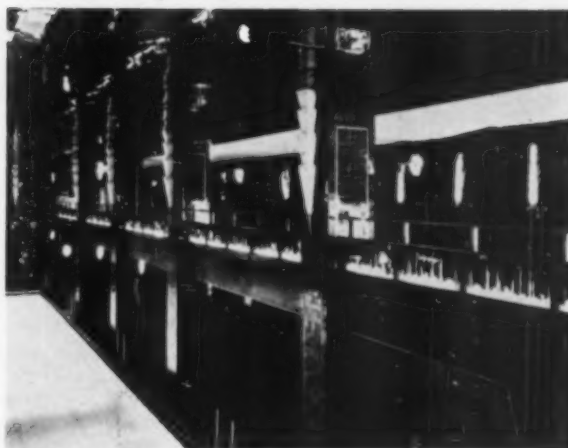
I consider colloidal substances of two general classes: class A, comprising such substances as pyroxylin, rubber, natural and synthetic resins, celluloid and celluloid substitutes, and, in general, colloids characterized by their solubility in an organic solvent; and class B, comprising such substances as casein, sodium or potassium silicates, and, in general, colloids characterized by their solubility in water and having great affinity thereto. I shall denote by *a* and *b* respectively any solvent of A and B. Generally, the solvent *b* is water. However, this restriction need not be made. The necessary condition, as regards the solvents, in the practice of my invention, is that *a* must not be a solvent of B, nor *b* a solvent of A.

Having made my selection of the substances A and B, together with their respective solvents, I mix a solution of A with a solution of B. I have found that this results in a mutual inter-action between the two solvents which causes simi-

(Continued on page 358)



The Tower Room in the Hotel St. George looks down five hundred feet below to the busy traffic of commerce on the East River. Phenol resinoid wainscoting of lustrous black emphasizes the silvery color of the walls.



The St. George salt water swimming pool has Formica wainscoting, in marble effect, below the gold mirrors which line side walls and ceiling, and a panel of soft green below the glass frieze of the balcony railing.

Laminated Panels in Building Interiors

Bakelite and Formica Stock find extensive applications in new wing of the Hotel St. George in Brooklyn

ANY visitor to the Hotel St. George in Brooklyn, even a chemist well informed of the versatility of phenol resinoids, may be surprised at the prevalence of these materials in the interior architectural details. Bakelite resinoid will be found on every floor of this immense hotel, from salt water swimming pool to Egyptian roof garden. The guest registers at a counter of polished black resinoid, and whether his room is on the fifth or twenty-fifth floor of the new Residence Tower, he steps from the elevator into a corridor panelled with Formica in a modernistic design of gold and rose. The tables and bureau in his room have tops of the same material in walnut finish. He finds it again in the swimming pool wainscoting and panelling. The counter in the pool lunchroom, the buffer plates on swinging doors between service pantries and kitchens, the wainscoting in any one of the three rooms of the coffee shop, the fifteen check-room counters for the banquet rooms and the ballroom, the wainscoting in two of the banquet rooms, the baseboard in the grand salon, the doors into the grand ballroom, are all of Formica. The guest can't get

away from it. Silently, but none the less insistently, it sings, "Wherever you go, I'm following you." And if he asks, the management will explain their choice of the phenol resinoids by saying that they have built "for permanency as well as beauty."

Contrasting Effects

From the viewpoint of beauty alone, their use is amply justified. Winold Reiss, Viennese interior architect, who designed the decoration for the sixteen banquet rooms, has achieved

some strikingly beautiful results in the Tower Room and the Chinese Room with lustrous black wainscotings which enhance the loveliness of colors in walls, ceilings, and draperies. Bakelite again demonstrates its versatility by a subtle trick of changing in quality to suit the colors with which it blends. The soft silver walls of the Tower Room rise from a base seemingly as soft and deep in texture as black velvet, while against the lacquer red of the Chinese Room, the black wainscoting shines with the smoothness and lustre of polished marble.

Famous Designers Use Laminated

Willy Pogany, designer of the immense room which contains the salt water swimming pool, has also made effective use of the phenol resinoids. The wall of the spectators' balcony has a five-foot wainscoting in marble effect, below the gold mirrors which cover walls and ceiling of the entire room. The front of the balcony, overhanging the pool, is faced with a panel of soft green below a frieze of decorated glass.



One of the twenty-five elevator corridors in the new St. George Residence Tower, panelled with laminated phenol resinoid in a brightly colored, modernistic design.

Pleasing Styles Prevail in New Pyroxylin Boudoir Accessories

DuPont Viscoloid introduces two newly designed vanity sets in a pearl effect of unusual beauty

By P. A. Dillman

Henry Ford some time ago said to a group of newspaper men, "We are no longer in the automobile business but in the millinery business." It was his way of paying tribute to the importance of style and color in motor cars and likewise in all kinds of merchandise today. These influences are notable particularly in the toileware industry when one contrasts the plain white ivory sets of ten years ago with the great variety of colorful boudoir accessories that are being made at the present time.

The changes that have brought about this consumer preference for style and color are many. The increased use of color in advertising, the growth in attendance at museums, the rise in bookings of foreign travel ships and the speed with which styles are broadcast by the radio, movies and newspapers — these are merely a few of the major influences that have been potent in our generation and have set up new standards in our tastes.

Clear, Lively Colors

The colors we prefer and those most universally popular today are not the somber hues that came out of Russia and were adapted by the French modern movement of five years ago, but clear, positive colors which are somewhat stronger than pastels. This can be best illustrated by the recent popularity of the lighter purple shades in wearing apparel as compared with the more sumptuous ones of past generations. Simplicity also characterizes the decorations, if any, that are commonly used with these clear, lively colors.

Reprinted from Du Pont Magazine.

Articles conforming to this general description, then, should be overwhelmingly popular. From the first reports this seems to be true of the new du Pont Lustris boudoir accessories, illustrated on this page. For years the entire toileware industry has been searching for a new pearl effect and in this pattern the Du Pont Viscoloid Company has produced one of the loveliest effects yet seen.

Rolling Pearl Effect

If you will study the mirror closely, you will discover that a beautiful satin-like pearl covers its surface. Its character becomes more and more visible the longer you look at it, until, as when a new light falls unexpectedly upon familiar things, you suddenly become aware of a certain ordered and beautiful motif. It is the beautiful rolling effect that gives Lustris pearl its charm.

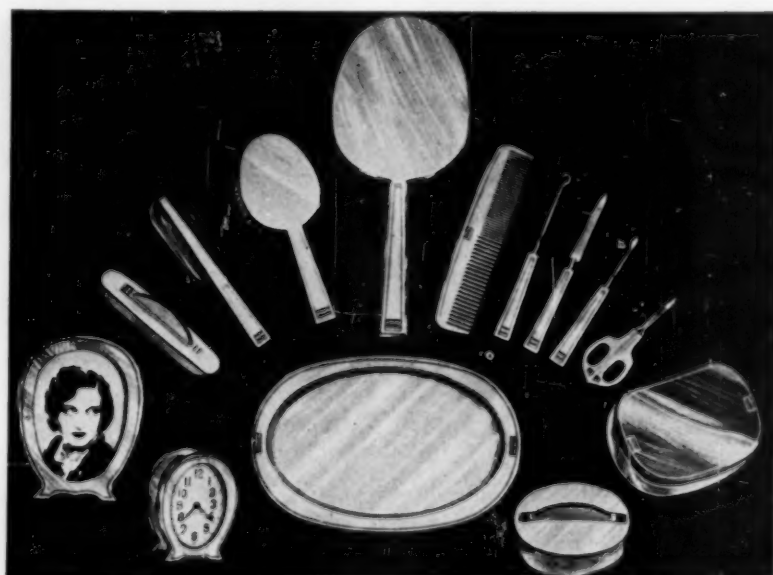
The smart black and gold decoration on the handle of the mirror, like that on all of the other pieces, adds further grace

to the set without destroying any of the original beauty of the pearl.

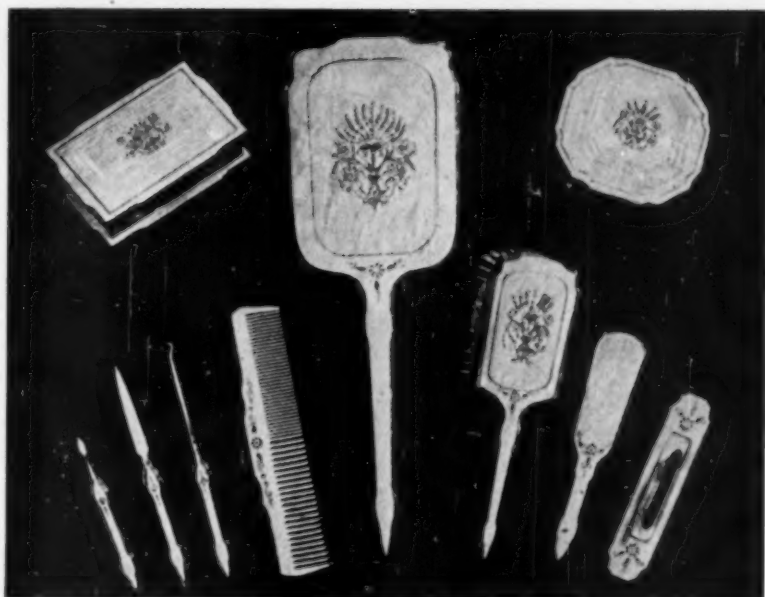
In jade, rose or maize colors, a set of the new du Pont Lustris will charm any bride, thrill any girl graduate or become the cherished remembrance of any birthday or anniversary. It is a gift any woman would prize.

Popular Priced Orleans Set

Another beautiful new toileware pattern among the many put on the market by the Du Pont Viscoloid Company this year is Orleans. Designed to meet the ever-growing need for popular-priced merchandise of good quality and pleasing appearance, it will also help you solve the problem of what to give the bride or the girl soon to be graduated. All the pieces in this set are triple beveled, an innovation this year. In jade, maize, rose or white pearl-on-amber color effects, Orleans with its attractive decoration will no doubt become an outstanding favorite.



It is the beautiful rolling effect of the Lustris pattern that gives this design a great deal of its charm.



The Orleans pattern was designed to meet the need for popular priced merchandise of good quality and pleasing appearance.

You will want to see both of these patterns and you will find them in your favorite store. Mirrors, combs, brushes and a colorful array of clever little

implements—with such a group available for selection, it will not be difficult to find the answer to many a gift problem.

Lumarith Begins New Service for Custom Molders

THE development of Lumarith by Celluloid Corporation is an interesting example of modern marketing methods. We have heard a lot about the new trend in distribution—how old fashioned selling is being replaced by more scientific procedure—how markets are being studied and thus cultivated on a factual basis rather than by guess work.

When Lumarith was an accomplished fact, when research had definitely ascertained all its physical characteristics and extensive tests had proven its adaptability for specific applications, then markets were studied. The result was the discovery of many new fields with tremendous possibilities. While many of these fields had never used molded articles to any great extent the figures showed a potential use of Lumarith running into the millions of pounds.

To analyze these fields, to secure full data as to their requirements and also to cultivate

and educate these prospective users of articles molded of Lumarith is a worthwhile contribution to the molding industry.

And that it is being done successfully is indicated by the fact that the first contact with a limited number of firms in one specific field has resulted in over 150 inquiries for Lumarith.

Now as a further step in developing rich new fields for molded products Celluloid Corporation has retained the services of an outstanding marketing executive—Mr. Benn C. Budd, who has been closely identified with the successful marketing of such products as Firestone Tires, Veedol Oil and Radiolas. Mr. Budd, as a member of the Celluloid staff, will be of service to the molding industry in developing and exploiting new applications for Lumarith through publicity and advertising.

The writer was very much impressed with Mr. Budd's en-

(Continued on page 361)

Electric Thermostat Is Housed in Molded Bakelite Case

"SURE-FIRE" electric high voltage room thermostat affords an accurate room temperature control for the private home. The special features of this thermostat are the quick "make and break" electrical mechanism, the extreme sensitivity of the thermostatic elements that operate the switch, the simplicity of construction and adjustment, and the positive accuracy and stability of the instrument over a long period of years. The "Sure-Fire" thermostat operates within 1° to 1½° temperature variation and remains in permanent adjustment without calibration. The case is of mahogany finish Bakelite molded material. Not only the color but the ribbed surface and octo-rectangular molding detail harmonize admirably with the usual fittings of the modern house.



Sure Fire Thermostat

Great Laboratory for Testing Insulation Completed in Britain

By A. C. Blackall

British Correspondent

IN the existing state of knowledge the performance of insulation cannot be predetermined except on an experimental basis. Sound and economical design consequently requires the provision of extensive investigational facilities for the study of various modifications and improvements in construction. With this object in view a new high-voltage laboratory has just been completed by the Metropolitan-Vickers Electrical Co. at Trafford Park, Manchester, and is claimed to be unique of its kind. Although it forms part of the company's research department, it is entirely independent from and additional to the extensive testing departments existing in the works. The objectives of the laboratory are essentially scientific and technical rather than commercial in character.

Need for Establishment

The problems arising in insulation design are in principle very similar to those attacked by that branch of engineering science known as the strength of materials. In both cases the investigator is concerned with the interactions occurring between two sets of variables: (1) the applied forces tending to disrupt the structure, (2) the resistance offered by various designs and materials to these disruptive forces. In both cases the attainment of a satisfactory design involves the consideration of three distinct problems:

(1) The structure has so to be dimensioned that it will withstand the stresses which are imposed on it by intent.

(2) It is necessary to consider the magnitude of the stresses which may be imposed by accident, and the strength of the structure in relation to them.

(3) It is necessary to consider various phenomena, mainly of atmospheric origin, which may reduce the strength of the structure in the course of time.

In the design of this new laboratory these problems were kept clearly in view. The laboratory consists essentially of three sections, viz., the main laboratory equipped for the study of phenomena with high voltages of power frequency, the surge laboratory equipped for the study of transient electric phenomena and the materials laboratory in which the behavior of insulating materials is investigated under all conceivable conditions of service. Structurally the laboratory consists of two semi-independent main buildings and an annex. The smaller of the two main buildings, which is 67 feet long and 47 feet wide, dates from 1923, when it was equipped as a 500,000 volt power frequency laboratory. When it was decided to extend the equipment to give 1,000,000 volts, the second main building (86 feet by 67 feet) was laid down, having one wall common with the original building of 1923. This latter has now been equipped with special apparatus for producing transient voltages and forms the surge laboratory previously mentioned.

Scope of Laboratories

The annex contains the materials laboratory, physical laboratories, a machine room where the necessary generators and other running machinery are isolated so as to reduce noise, and offices for the accommodation of the laboratory staff. The room on the upper floor is equipped for general electrical and physical testing of insulating materials. There is an auto-

clave in which tests can be made under various atmospheric pressures, and a number of conditioning chambers used for stoving samples prior to test under fixed and definite atmospheric conditions. In the middle of the room are four testing chambers in which electrical tests at pressures up to 100,000 volts can be carried out at various degrees of humidity and temperature. Two tanks are also provided for making electrical tests in either hot or cold oil. The electrical equipment of the laboratory consists of three transformers of 11,000, 22,000 and 100,000 volts, the control of which is effected by push buttons and motor operated rheostats. This enables the voltage rise in a test to be made entirely independent of the personal equation of the operator. Other equipment in the laboratory consists of apparatus for making porosity and temperature cycle tests on insulators, drying and adhesion tests on fire-resisting materials and a great deal of other apparatus designed for special purposes.

High Tension Testing

The room on the ground floor, commonly referred to as the 100 kilo-volt laboratory, is intended for investigations on apparatus and materials which can be carried out within this voltage range. A general view of this laboratory is given by the accompanying photograph. The electrical equipment consists of a 50 cycle 30 kVA. transformer for 100,000 volts supplied from a motor generator set and controlled in the usual manner. The central feature in the illustration is a cylindrical air condenser, employed as the standard of comparison in a Schering bridge used for the

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measurement of dielectric losses. The principle of this method is well-known, but the diagram of connections is reproduced for those who are unfamiliar with it. The dielectric losses in the sample studied are arrived at from measurements of the capacity of this sample and the power factor or phase angle between the applied voltage and the current flowing. Referring to the figure, C2 is the standard air condenser, C1 the capacity formed by the sample, R3 the amplitude balancing resistance, R4 the ratio resistance, and C4 the phase balance-

ing condenser; in the center is a vibration galvanometer, showing zero deflection when the bridge is balanced.

The measurement of dielectric losses according to this method has proved to be an invaluable means of studying the behavior of insulation under various conditions of service, and test equipment for making such measurements at pressures up to 300,000 volts has recently been constructed and installed in the company's switchgear factory. This is believed to be the highest voltage for which ap-

paratus of this type has yet been built.

The investigations carried out in this laboratory extend over a very wide field. Breakdown and loss tests on insulating materials, electro mechanical tests on porcelain insulators, design studies on switchgear, transformer and generator parts are matters of frequent occurrence. Sir Ernest Rutherford, the famous scientist, has expressed confidence that the opening of this laboratory will lead to a wide extension of knowledge in many directions and will prove invaluable to the electrical industry.

NEWS of the INDUSTRY

Du Pont Viscoloid Leominster Factory Named "Doyle Plant"

THE fifth anniversary of the consolidation of the Viscoloid Company with the du Pont Company was celebrated at a meeting in the Leominster City Hall, Leominster, Massachusetts, on Tuesday evening, May 6th. The meeting was attended by about 1200 people made up of employees and their families, together with representatives of the Arlington, New York and Wilmington organizations.

The feature of the meeting was the presentation of 600 five-year service pins to those employees who have completed five years' service under the du Pont organization.

Service Pin to Mr. Doyle

Mr. Lamot du Pont, president of E. I. du Pont de Nemours & Company, personally presented the service pin to Mr. B. W. Doyle, former president of the Viscoloid Company, who is now vice-president of the Du Pont Viscoloid Company. At the same time Mr. du Pont announced that in honor of Mr. Doyle the name of the Leominster Plant has been changed to the "Doyle Plant."

Mr. C. W. Rehor, director of production of the Leominster

Articles Department, acted as chairman of the meeting. Speakers included Mr. Lamot du Pont, president of E. I. du Pont de Nemours & Company; Mr. C. K. Davis, president of Du Pont Viscoloid Company; Mr. B. W. Doyle and Mr. D. F. Carpenter.

The speeches were followed by dancing and refreshments.

Building Operations At New Bakelite Plant

WORK on the actual construction of buildings for the first unit of the Middlesex Borough, New Jersey plant of the Bakelite Corporation will be started soon according to E. Hagaman, resident engineer for Francisco and Jacobus, who will direct the construction work of the plant on the 125 acres of ground in the borough.

It is expected that the grading of the property will be completed within the next two weeks, and that work on the construction of the buildings will be started immediately afterward.

It is reported that the laboratories building, which will be one of the first erected, will be a three-story structure, but the dimensions of the building and the size of the other buildings has not been made public.

Pyroxylin Plastics Exports Increase

DURING the first quarters of the last three years, United States exports of pyroxylin plastics (in the form of sheets, rods, or tubes) have increased as follows: 1928, \$554,761; 1929, \$601,887; 1930, \$664,005. The principal foreign markets in the first quarter of 1930 follow:

Country	Value
Canada	\$446,021
United Kingdom	185,264
Germany	8,436
Australia	6,676
Japan	4,374
Others	13,234

Nowacke & Loesser Co. established for over thirty years at 149 Sanford St., Brooklyn, in the manufacture of Bag Frames, Bag accessories, Millinery ornaments and Jewelry Novelties in celluloid and other Pyroxylin Plastic materials, have opened a show room for the convenience of their customers at 303 5th Ave., New York City, where a complete line of their latest creations will be shown.

Mellon Institute to Have New Building

DR. Edward R. Weidlein, Director, Mellon Institute of Industrial Research, Pittsburgh, Pa., has announced, speaking for the Board of Trustees, that the institution is to increase its

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facilities for serving American industries by a building project that will enable the material expansion of all its research activities. Detailed plans are now being prepared by the architects, Janssen and Cocken, of Pittsburgh, and construction will begin as soon as the drawings are completed, early this fall. The Mellon-Stuart Company, also of Pittsburgh, is the general contractor.

The building, which is to occupy the site of the Institute's Building No. 2, is designed on classical lines, a plain, simple, but massive structure, surrounded by columns. It will provide ample space for housing many more Industrial Fellowships than the 63 that now tax the Institute's facilities to the utmost. The other departments of the institution will be increased in proportion.

More Space Needed

When the present home of the Institute was completed, in 1915, it was felt that the Industrial Fellowship procedure created by Robert Kennedy Duncan had passed from the experimental to the practical stage. The building, which was given to the institution by Andrew W. and Richard B. Mellon, incorporated the best laboratory constructional features of that period. It was thought then that it would provide adequate space for growth for many years; but for practically 10 years the Institute has had a waiting list of companies, often almost as long as the roster of companies whose problems were being investigated. Even the additional space afforded by Building No. 2, acquired in 1927, gave but temporary relief from the need for more laboratories arising from proposed new investigations and from the necessity of increasing the personnel of fellowships already in operation.

In addition to providing a greatly increased number of laboratories, the new building will give more commodious quarters for the general depart-

ments. The present library contains 11,000 volumes; the new library is planned to accommodate 250,000 volumes. The present Department of Research in Pure Chemistry will be expended and facilities for pure research in other branches of science will be provided. Much more elaborate chemical engineering laboratories are to be available in the new building, and also the fellowships in each specific field of industrial research are to be grouped in suites of rooms so that they can best make use of general apparatus adapted to their needs. Certain rooms will be equipped for specialized phases of experimental technique, such as electrochemistry, spectroscopy, low-temperature studies, radiations, high-pressure experimentation, etc. Other special features to be included are a large lecture hall, a dining hall, an industrial fellowship museum, and an underground garage. For the past five years members of the Institute's Executive Staff have been visiting important laboratories in America and Europe to obtain information on new features in design and equipment.

Porous Pyroxylin Plates

(Continued from page 350)

lar reactions between the two materials in solution, namely, B will be precipitated in a finely divided form by the action of the solvent *a*, and, at the same, A will be precipitated by the action of the solvent *b*, the finely divided particles of B permeating the precipitated mass of A. When the solvents begin to evaporate, I have found that the vapor will always contain a substantial proportion of the solvent *b*, and this proportion continually increases as evaporation proceeds, until, in the last stages of evaporation, the vapor is almost pure *b* (water). As a result, since *b* is antagonistic to A, at no stage is there any possibility of an impervious film of A forming either on the surface, or anywhere in the mass,

of the substance obtained, as in the case when the vapor is pure *a*, or at all times rich in *a*.

An illustration in the specific case where the colloid selected from class A is a cellulose nitrate, the solvent *a* is acetone, the colloid selected from class B is sodium silicate, and the solvent *b* is water. The proportions in this illustration are as follows:

Illustration

Fifty grams of cellulose nitrate, treated with seven and one half ounces of acetone until dissolved. The quantity of sodium silicate used is eighty cubic centimeters. After mixing thoroughly, add a little acetone to make the mass more plastic.

After being pressed into a sheet, the mass is left to harden in the air. It is then placed in water which is changed several times, until all of the sodium silicate is washed out. After drying, the sheet shows no surface skin and a porosity of about fifty percent, i. e. when soaked in water it weighs about twice what it weighs when dry.

The porosity of the product as obtained by my process may be varied and is controllable both as regards the number of pores and their size. The greater the proportion of B mixed with A, the greater will be the number of pores. The size of the pores may be controlled by the rate of evaporation. The evaporation depends on several factors, such as the thickness of the material, the character of the solvents, or the humidity of the atmosphere. I have found that the pores are larger or smaller in size according as the humidity is higher or lower. As to the effect of the thickness of the material, naturally, the thicker it is the slower will be the rate of evaporation.

My method, further, offers excellent means for meeting a great variety of other conditions that may be imposed on the material to be used. For instance, it may be desired that the material be particularly resistant to a certain acid. This

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condition is met by selecting among the members of the class A the one which most resists the action of this particular acid. Or, the condition imposed may be that the material be non-inflammable. Accordingly, I select from among the members of A the one meeting this condition, as for instance, a cellulose acetate, or one of the many synthetic resins possessing the desired property. Again, the condition imposed may relate to the mechanical strength of the substance. The suitable members among A will be se-

lected without difficulty, the physical and chemical properties of all the members of the group being known in the art.

In the above given example, the porous substance was intended for use as a storage battery separator. Sodium silicate, selected as the member of class B, offers especial advantages in this connection. It meets all of the conditions which are necessary in the practice of my invention. It has a very great affinity for water. It acts as an excellent binder for the mass during the shrink-

ing process. Even should some of it remain in the substance when actually used in a battery, it does not interfere with the efficiency of the separator or battery since, when attacked by sulfuric acid, it precipitates silica (SiO_2), a finely divided powder. As for the member A, I find that it makes no noticeable difference whether I use cellulose nitrate or commercial celluloid, so that I may proceed either by following the well known steps in the manufacture of celluloid, up to the stage where my treatment is applied

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to the material, or make use of the prepared commercial celluloid.

The appearance of the product, when free from pigments, in form of a thin sheet, suitable for use as a storage separator, is that of grayish white blotting paper. It has none of the horny, glossy character of ordinary celluloid. It has sufficient mechanical strength for the intended use and, of course, all of the acid-resisting quality of celluloid. Preferably, the sheet is ribbed, but the porosity of the material is such that it will exercise its function even when

it is ribless and in continuous contact with the battery plates. Among its many advantages, as compared with wood separators, are controllable porosity, lower internal resistance, greater resistance to acid, greater pliability, more uniform mechanical strength, reduced danger of short circuiting, a negligible expansion when immersed in a liquid (I found a standard wood separator to expand about 10% in the direction at right angles to that of the ribs when immersed in water), and many other features apparent from the nature of the material;

while it shares with the wood separator the advantages of cheapness, light weight and small bulk. —

New Lumarith Service

(Continued from page 353)

thusiasm and faith in the future of molded products. During a recent conversation Mr. Budd outlined his viewpoint as follows:

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Resinoids in Grinding Wheels

(Continued from page 348)

high speed, combined with the tenacity developed by the Bakelite bond, when combined with a properly selected abrasive, is most efficient on certain types of work.

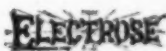
In fact, the resinoid wheel, that is to say, abrasive grain when bonded with a synthetic resin and forced in moulds to the shape of grinding wheels, is very largely used for the snagging of steel castings. Large heavy wheels are used for this work, with the resultant rapid removal of fins, seams, scales and such excess material as must be removed from castings. In the grinding of steel billets, removing scale and other objectionable features, the high speed grinding wheel is most efficient. There is also another large field where the Bakelite type wheel is very efficient and that is the thin wheel known as the cut-off type of wheel. These wheels vary in diameter from sixteen inches to six inches and in thickness from a thirty-second to a quarter of an inch.

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The future of the Bakelite bonded grinding wheel seems to be assured on specific types of work, and really presents an improvement and an advance in the art of grinding in these particular cases. The big field of application, however, at the present time and undoubtedly for the future, will be the Vitri-fied bonded type of grinding wheel.

Wide Uses in the Future

The application of condensation products to the proper bonding of grinding wheels is still in its infancy. Many factors other than that of bonding alone must be considered. The application of a grinding wheel to the proper "job" or the proper specification of the grinding wheel is as important and vital a factor in its successful application as is its composition. Both present so many variables to the manufacture and to the user alike that naturally developments and expensive experiments are approached with considerable caution by all concerned.

We can conclude, however, that the resinoid type grinding wheel has made a permanent place for itself in those plants employing certain grinding operations. Just what the future holds for the synthetic resins in the field of grinding wheel manufacture is hard to predict. It is certain that constant improvements in resin manufacture will provide materials of such a quality and of such a cost as will provide larger fields of application.



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This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in PLASTICS. Please mention PLASTICS when writing to these firms.

And Now, In Closing:

WELL, well! . . . almost half of our total pyroxylin exports this year have been to Canada and the United Kingdom . . . Over one-quarter to the latter . . . what does that mean? See the Publisher's column . . . Every molder seems generally "regusted" with all the experimental work floating around . . . One large, misnamed, button company so much so that it's working three days a week . . . eight hour days . . . Business (molders, casein, pyrox, etc.) seems to stick close to that 30% under normal figure . . . somebody says Labor Day will see another crash . . . what! On a holiday? . . . To the man who writes re. our temporary slogan, "watch urea"—we've been watching it; some does, some doesn't . . . one of the semi-metropolitan molding plants is going in for 94 (count 'em) additional presses . . . also a new department . . . for these new, light colored materials . . . One producer (powder) is refinancing . . . another (sheets) is in trouble . . . And there is altogether too much price-cutting on casein . . . Charley Burroughs comes back from a vacation voyage to the West Coast . . . And, incidentally, Schlesinger yachts on vacations . . . we work, contrary to opinion . . . cold molding seems to be going strong . . . The man who sends out those International blue-prints must work overtime . . . Watch for a consolidation . . .

THIS is not the only trying period that organized industry has faced, and it would seem that executives should remember some of the others. There is a lot of forced unemployment; forced, that is, because an executive gets dissatisfied and leaves his job without the assurance of definite employment elsewhere. At this

time such procedure is foolish; the raft of skilled unemployment in the molding industry alone is startling. If these men, who are now searching for positions, had only taken the precaution to investigate first they would not be among that reputed "vast army". The chances are that they would still be at their old offices.

BELIEVE it or not, but we understand there are dresses on the market that use long rows of buttons up the back, and that these are being sold right here in New York City. We do not know the manufacturer, but some progressive button man should encourage this. We also hear that styles will change again shortly, causing a distinct loss to the textile industry and a gain to the plastic.

WE heard an interesting remark by a well known advertising man the other day to the effect that all the various mergers in the chemical industries are responsible for a great proportion of the unemployed. This same man was reported to have said that Henry Ford was the most widely hated man in industry to-day. The only peculiar thing in these comments is that this individual handles the advertising for two automobile companies and one or more chemical houses. They say he owes his job to straight thinking. Perhaps he is overdoing it.

AS to the generic name—a much worn out subject, if we read our mail rightly—we want to leave a parting shot in answer to several suppositions on the part of subscribers. We have not been convinced of its necessity or usefulness, but we did not oppose the idea; we are always open minded, we firmly

believe, however, that before long the subject will be reopened (and with greater reason) for really serious consideration. We are sorry to hear that W. L. Kempton, who headed the movement for adoption of a name, has retired from active connection with Bryant. We hope he will continue to lend his aid and advice to the molder's problems.

A LETTER before us as we write this expresses mild wonder at the industry for not having sent a group of men to Europe to study methods and outlets. There are several reasons why this has not been done, and yet we believe it would be a good move for some time in the near future. Perhaps a study of American methods and outlets would be the first logical step! And as the writer of the letter mentions there is a golf course at Sandwich, England, we call his attention to the fact that practically every molder in this country belongs to his own club, and that Ben Conner and George Scribner should make a great team on any course.

WE seem to be occupied with our mail this month. Frankly, we're almost bothered by it! So far we have had forty-seven requests for information, and most of them have taken a lot of time. We just cannot stop thinking about them, and especially about the one that begins, "I want to subscribe to your good sheet, and will you please tell me how many patents have been issued on the manufacture of plastics". Heaven help us, so we're a sheet! Next month we shall probably use some pink paper on a stock supplement! As to your question, mister, we should say that there are, roughly speaking, about two hundred and ten million. But perhaps we're wrong.